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*by*

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# Cossuridae (Annelida: Polychaeta: Sedentaria) from Australian and Adjacent Waters: the First Faunistic Survey

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ABSTRACT. The collection of Cossuridae at the Australian Museum was investigated. Nine species were identified. Most specimens were from New South Wales and Queensland, but some specimens were also from Victoria, New Zealand, Fiji, Borneo, and the Philippines. Three new species were described: *Cossura hutchingsae* n.sp., *C. keablei* n.sp., and *C. queenslandensis* n.sp. *Cossura consimilis* Read, 2000 was redescribed using non-type material. *Cossura aciculata* (Wu & Chen, 1977) was identified from the coast of Borneo and the Philippines for the first time, and intraspecific variability in the number of thoracic chaetigers noted for that species. Three species, *C.* cf. *ginesi*, *C.* cf. *longocirrata* and *C.* cf. *pygodactylata,* were found to be morphologically similar to *C. ginesi, C. longocirrata,* and *C. pygodactylata,* respectively, but probably represent new species as they were found far from the known areas of the listed species. A key of the known cossurid species of Australian and adjacent waters is given, and taxonomical characteristics of Cossuridae are discussed.

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Cossuridae Day, 1963 is a small family of benthic polychaetes. Cossuridae is composed of 23 species, all in the genus *Cossura*. Cossurids inhabit shallow marine sediments, and, in deep-sea habitats, they also commonly inhabit mixed sand and mud. In Australian waters, the family has been reported along the southern and eastern coasts, but specific species have not been previously identified (Hutchings & Murray, 1984; Hutchings, 2000). One species, *Cossura consimilis* Read, 2000, was identified in New Zealand.

Cossuridae species are difficult to distinguish morphologically and do not have many taxonomic characteristics. Some of the described species are very similar and differ by only one feature. For example, *C. longocirrata* Webster & Benedict, 1887 and *C. pygodactylata* Jones, 1956 differ by the presence of pygidial intercirral appendages in the latter, and *C. soyeri* Laubier, 1963 and *C. consimilis* differ by the positioning of the branchial filament. Some species have been described using incomplete specimens; the descriptions of those species are too short, and the most important characteristics of those species remain unknown (see Read, 2000, table 1 for review). Taxonomic revision of this family with reinvestigation of type materials and a large number of specimens for each species to reveal intraspecific variability and molecular genetic methods is required.

The taxonomic characteristics used for the differentiation of cossurid species are as follows. Prostomium shape varies from conical (triangular from dorsal view) to round, trapezium-shaped and almost quadrangular. The length to width ratio of the prostomium is usually close to 1:1; refer to the discussion on the delineation of the prostomium and the peristomium below. The tip of the prostomium is never drawn and does not form a palpod as is the case in some

orbiniids and opheliids. A conical prostomium can have a more or less pointed or rounded tip. Despite difficulties in the verbal description of the small differences in the shape of the prostomium and certain intraspecific variability, we believe this characteristic could be useful for the distinction of closely related cossurid species. One species (*C. ginesi* Liñero-Arana & Díaz-Díaz, 2010) was described due to the unique shape of its prostomium with anterior horns.

The problem with prostomium-peristomium demarcation in cossurids has been discussed for a long time. Some authors (Hartman, 1955, 1967, 1976; Fauchald, 1972; Orensanz, 1976; Read, 2000; Liñero-Arana & Díaz-Díaz, 2010) believe that at least some cossurid species have two anterior achaetigerous segments or that the peristomium is divided into two rings. By sectioning and studying numerous specimens, Jones (1956), Fournier & Petersen (1991), Bachelet & Laubier (1994), Hilbig (1996), Zhadan *et al.* (2012) showed that the first of these rings is part of the prostomium. An investigation by Zhadan *et al.* (2014) of the muscular system in *Cossura pygodactylata* using falloidin labelling confirmed that the attachment of the longitudinal dorsal and ventral muscle bands is close to the middle of the prostomium length, which is unusual for polychaetes. When these muscles are contracted, the anterior portion of the prostomium is slightly drawn inside the posterior portion, which forms the posterior prostomial ring. In relaxed specimens, the furrow dividing the prostomium ("prostomial furrow"; Hilbig, 1996) is less distinct or absent. Nuchal organs are shifted anteriorly, close to the prostomial furrow. The mouth opening is located between the prostomium and the peristomium. In *C. pygodactylata* juveniles, the posterior edge of the prostomium bears the prototroch, which also demarcates the border between the prostomium and peristomium (Zhadan *et al.*, 2012). In the present study, we accepted the second point of view and considered the anterior ring as a part of the prostomium and considered the peristomium to consist of one ring.

The pharynx of cossurids is represented by dorsal buccal tentacles, which vary in number within individuals of one species (Jones, 1956; Fournier & Petersen, 1991; Zhadan *et al.*, 2012, 2014). They are rarely seen outside of the mouth, and this character most likely cannot be used for cossurid taxonomy.

The insertion of the branchial filament is one of the most important characteristics for cossurid species identification. In some species, it arises from the middle of one of the anterior segments (i.e., *C. brunnea* Fauchald, 1972 has the filament attached to the middle of chaetiger 3) or is shifted toward the anterior or posterior border of the segment (i.e., *C. pygodactylata* has the filament arising from the posterior border of chaetiger 2). In other species it is located exactly on the border between the segments, or a segment can have dorsal extensions from which the branchial filament arises (this is the case for the description of *C. bansei* Hilbig, 1996, fig. 9.1,e,f). Another problem in cossurid identification is that the anterior segments in cossurids are quite short in comparison to their filament diameter, especially when the animal is contracted. In these cases, it is hard to define the exact position of the branchial filament insertion. For accurate definition of this characteristic, it is better to observe animals both from dorsal and lateral sides, and if possible, choose well relaxed specimens, use methylene blue or methyl green staining to contrast the segmental borders, and use scanning electron microscopy. In the present work, in specimens that were difficult to identify we did not define one segment of filament attachment but indicated two of them, i.e., "between chaetigers 2 and 3".

The body of Cossuridae specimens is divided into two regions, anterior thorax and posterior abdomen, and occasionally, several posterior segments form the third, posterior region. Here, we used the terms "thorax" and "abdomen" with no regard to the homology of those terms with these regions of other polychaete families. Thoracic segments are short, usually flattened dorsoventrally and chaetae emerge from the anterior border of the segments; abdominal segments are longer, often bead-like, and chaetae emerge from the middle of them. For cossurid taxonomy, the most important characteristic is the number of thoracic segments. In some species of the previously referred to genus *Cossurella* Hartman, 1976, the transition from the thorax to the abdomen is very clear, because the abdominal segments bear spine-like or acicular-like chaetae, but in other species, this border is indistinct, and accurate counting is difficult. In the present work, we considered the main indicator of the transition from the thorax to the abdomen to be the position of the chaetal bundles: the first abdominal segment is the segment that has chaetae situated in the middle. The number of thoracic segments increases with the size of the worm and considerably vary between individuals within a species (Fournier & Petersen, 1991; Bachelet & Laubier, 1991; Hilbig, 1996); thus, for accurate identification, it is necessary to investigate several adult specimens.

Chaetal types and arrangement are very similar in all cossurids. The first chaetiger is uniramous, and all others are biramous. In the thorax, chaetae are arranged in two vertical rows in both rami. All thoracic chaetae are hirsute capillaries of differing lengths and thicknesses. Usually, chaetae of the anterior row are thicker than those of the posterior row, and anterior neurochaetae are often thicker than anterior notochaetae. In some species, i.e., *C. rostrata* Fauchald 1972, *C. brunnea*, *C. ginesi,* coarse thickened chaetae become short, curved and taper abruptly. *Cossura heterochaeta* Orensanz, 1976 also have curved acicular chaetae with blunt tips in the anterior neuropodia (Orensanz, 1976: figs. 2,3b). Differences in the size and shape of chaetae gradually diminish toward the abdomen. Abdominal chaetae are slender capillaries in most species; they are thinner and less hirsute than thoracic chaetae and do not form distinct rows. In some species of the previously referred to genus *Cossurella,* abdominal segments bear acicular-like chaetae, one per rami, or are accompanied by a single capillary.

The pygidial appendages are important for species identification. Most cossurid species have three long anal cirri, one ventral and two dorsal. In addition to anal cirri, *C. pygodactylata* has 12–20 finger-like intercirral processes, but juveniles of this species do not possess cirri or appendages (Bachelet & Laubier, 1991; Zhadan *et al.*, 2012). In *C. pseudakaina* (Ewing, 1987), the pygidial rim is scalloped and bears only one short ventral cirrus. In *C. coasta* Kitamori 1960, three pygidial cirri are branched at their ends. Unfortunately, cossurids are very fragile and usually only their anterior ends are present in collections. For many species, the structure of the pygidium remains unknown (Read, 2000).

Staining with methyl green can be useful for the identification of cossurid species (Hilbig, 1996). However,

this method does not always work with old museum specimens. We did not have methyl green available for the present work, so this identification method was not performed.

Pigmentation: Living *C. pygodactylata* are yellowish or tan with golden or brown chaetae and red blood vessels (Zhadan *et al.*, 2012). Preserved cossurid specimens are usually colourless or yellow. *Cossurella sima* Fauchald, 1972 is yellow with dark brown pigment spots at the base of each parapodium in the anterior region of its body. *Cossurella brunnea* Fauchald, 1972 has a dark pigment pattern over the median and posterior regions of its body (Fauchald, 1972); according to Hilbig (1996), this species has the colour from light to mottled dark brown, and the pigmentation is concentrated in the anterior thorax.

## Materials and methods

Material belonging to the family Cossuridae in a collection at the Australian Museum (Sydney) was studied. Samples have catalogue numbers beginning with "W". Specimens were investigated with a stereomicroscope, staining with methylen blue was used to make small details more contrasted. Some of the specimens were temporarily mounted in glycerol and studied with a compound microscope. Stacks of images were combined using Helicon Focus software to achieve completely focused images. A few specimens were dried to a critical point, coated and examined using a Zeiss EVO LS15 and Camscan S2 Scanning Electron Microscope (SEM). All specimens including dried and coated remained in Australian Museum collection.

# Systematics

## Cossuridae Day, 1963

Key for species of Cossuridae of Australian and adjacent waters

| | | |
|---|---|---|
| 1 | Prostomium with anterior extension; very thick thoracic neurochaetae, 9–11 thoracic chaetigers | *Cossura* sp. cf. *ginesi* |
| —— | Prostomium without anterior extension | 2 |
| 2 | Abdominal segments with two short acicular chaetae per parapodium | *Cossura aciculata* |
| —— | Abdominal segments with capillary chaetae only | 3 |
| 3 | Thoracic segments swollen, with dorsolateral glandular pads; prostomium obtuse, round | 4 |
| —— | Thoracic segments not swollen, prostomium conical, round or trapezium-shaped | 5 |
| 4 | Anterior margins of the segmental borders dorsally are drawn forward, toward the base of branchial filament; prostomium with round or almost straight anterior margin, very thick thoracic neurochaetae | *Cossura hutchingsae* n.sp. |
| —— | Anterior margins of the segmental borders dorsally perpendicular to body axis; prostomium round. Big worms, body thick, cylindrical, 28+ thoracic chaetigers, thoracic neurochaetae thicker than notochaetae | *Cossura* sp. A |
| 5 | Prostomium rectangular or trapezium-shaped, with round or almost straight anterior margin, 22–26 thoracic chaetigers | *Cossura keablei* n.sp. |
| —— | Prostomium conical, with pointed or round tip; 13–22 thoracic chaetigers | 6 |
| 6 | Thoracic neurochaetae notably thicker than notochaetae; prostomium with pointed tip, pygidium with 3 anal cirri but without intercirral processes | *Cossura* sp. cf. *longocirrata* |
| —— | Thoracic neurochaetae have almost the same width as notochaetae | 7 |
| 7 | Pygidium with 3 anal cirri and interracial processes, prostomium with pointed tip; branchial filament arising from posterior part of chaetiger 2 | *Cossura* sp. cf. *pygodactylata* |
| —— | Pygidium with 3 anal cirri but without intercirral processes, prostomium with round tip; branchial filament attached to segmental border between chaetigers 2 and 3 | 8 |
| 8 | 17–20 thoracic chaetigers, thoracic width 250–300 µm | *Cossura queenslandensis* n.sp. |
| —— | 21–32 thoracic chaetigers, thoracic width 300–660 µm | *Cossura consimilis* |

## Species descriptions

### *Cossura aciculata* (Wu & Chen, 1977)

Figs 1–3

*Heterocossura aciculata* Wu & Chen, 1977: 100, fig. 1A–G.
*Cossurella aciculata* Ewing, 1987: 8.

**Type locality**. Qingdao, East China Sea.

**Material examined**. *Philippines*. 2 specimens, West coast of Marinduque island (13°30'N 121°30'E), Dec. 1996, col. MARCOPPER staff, W.27174; 1 specimen, West coast of Marinduque island, (13°30'N 121°30'E), Dec. 1996, col. MARCOPPER staff, W.42861.—*Borneo*. 1 specimen, Bintulu (Similajau National Park), Sarawak, depth 5.5 m, 1992, col. L. Tak Seng, W.196246.

**Description**. Complete specimen with about 60 chaetigers, about 15 mm long, 450 µm wide (Fig. 1A). Fragments with 23, 35 and 30 chaetigers. Anterior region (thorax) with 22 chaetigers in two specimens, 26 in one specimen; one specimen represented by fragment with 23 chaetigers, all thoracic. Border between regions very sharp; anterior region (thorax) with bundles of long capillary chaetae in both rami of parapodia, in abdominal region only one short acicular chaeta per ramus (Fig. 1A,B,D,E). Anterior segments with glandular inflations divided by dorsal groove; their borders perpendicular to body axis (Figs 1B,C, 2B). Abdominal segments longer, with thin body wall; one

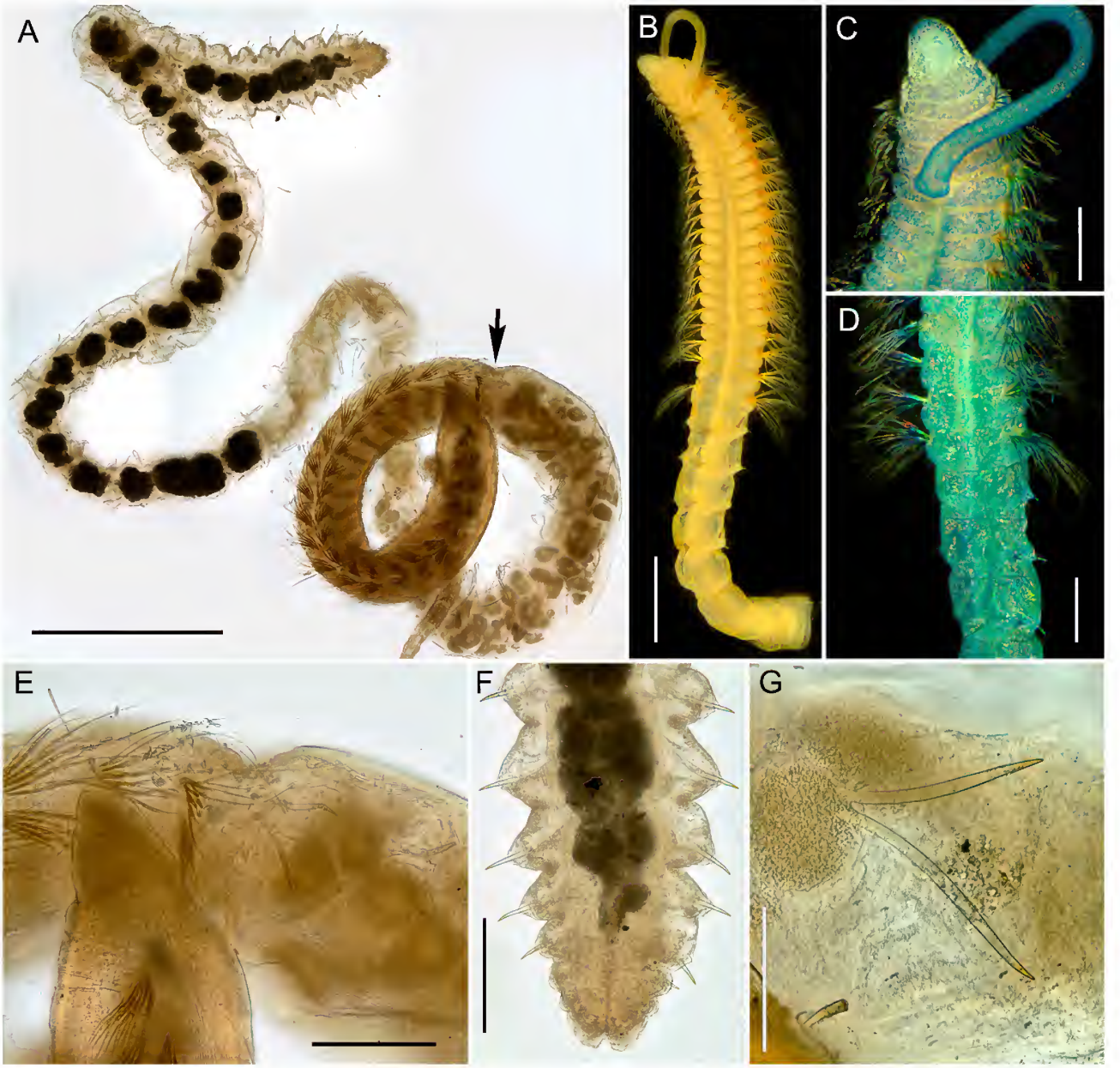


Figure 1. *Cossura aciculata* (Wu & Chen, 1977). Light microscopy. *A, E–G* (W.27174), mature female, compound microscope; *B–D* (W.196246), stereomicroscope. *C, D* stained with methylen blue. *(A)* general view (arrow indicates transition between thorax and abdomen); *(B)* dorsal general view; *(C)* anterior end, dorsal view; (*D)* transition between thorax and abdomen, ventral view; *(E)* head and transitional region, lateral view; *(F)* posterior end, ventral view; *(G)* parapodium of abdominal region, lateral view. Scale bars: *A* = 1 mm, *B* = 500 µm, *C–F* = 200 µm, *G* = 100 µm.

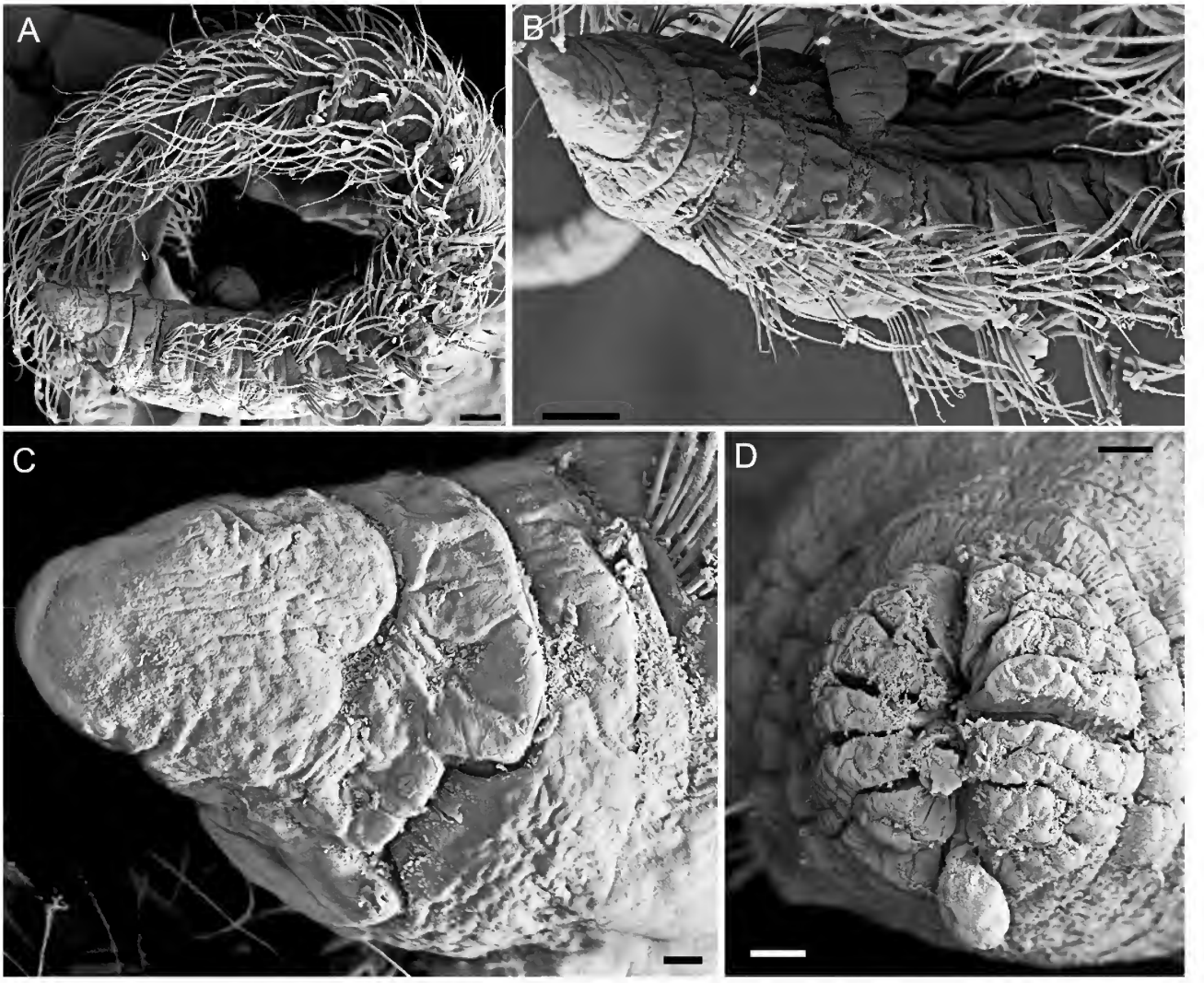


Figure 2. *Cossura aciculata* (Wu & Chen, 1977). SEM, W.42861. *(A)* thoracic region, lateral view; *(B)* anterior end, dorsolateral view, showing branchial filament attachment; *(C)* head, ventrolateral view; *(D)* pygidium, posterior view. Scale bars: *A, B* = 100 μm, *C, D* = 20 μm.

specimen from Philippines with oocytes (diameter 100–150 μm) in anterior part (Fig. 1A,E).

Prostomium short, bluntly conical with round tip; prostomial furrow developed in some specimens; posterior ring as long as peristomium, with midventral notch (Figs 1B,C, 2B,C). Branchial filament inserted to anterior margin of third chaetiger (Figs 1C, 2B). Nuchal organs not seen.

Chaetiger 1 with uniramous parapodia, all the next segments with biramous parapodia. All chaetae in thorax hirsute capillaries with smooth shafts; arranged in two indistinct rows. Chaetiger 1 bears 6 + 4 chaetae, posterior ones thinner; next chaetigers bear about 10 chaetae in notopodia and 10 in neuropodia. All capillary chaetae similar by length, and only slightly differ by width (Figs 1A,E, 2A,B, 3A,B). Abdominal chaetae short, slightly curved, acicular-like; one chaeta per ramus (Figs 1E,F,G, 3C,D). In posteriormost segments chaetae emerge from cushion-like body wall inflations (Fig. 3C). Lateral organs seen in posterior chaetigers between rami (Fig. 3D,E).

Pygidium present in one specimen; divided in about 10 lobes, but without appendages, except for one small bulb located midventrally (Figs 1F, 2D).

**Remarks**. *Cossura aciculata* inhabits Yellow Sea, East China Sea and South China Sea (Wu & Chen, 1977). Material cited here extends the distribution of *C. aciculata* to the coast of Borneo and Philippines. Specimens from the present study differ from the original description by: 1) number of thoracic chaetigers indicated as 22 only in original description, but in our material two specimens have 22 chaetigers and two more (26 and 23+); 2) the number of chaetae in thoracic chaetigers is less than 10 instead of 12–20 per ramus in the original description; 3) our worms are smaller (15 mm vs 70–75) and have less segments (60 vs 100–112).

Other cossurid species bearing acicular chaetae in abdomen (previously grouped in the genus *Cossurella,* revised by Ewing, 1987*)* are *C. sima* Fauchald 1972 (28–29 thoracic chaetigers, abdominal spines accompanied by capillary chaetae), *C. pseudakaina* (Ewing, 1987) (abdominal chaetae long tapering with thin plumose distal part), *C. dimorpha* (Hartman, 1976) (29 thoracic chaetigers, branchial filament inserted between chaetigers 3 and 4), *C. pettiboneae* (Ewing, 1987) (23 thoracic chaetigers, branchial filament inserted between chaetigers 3 and 4).

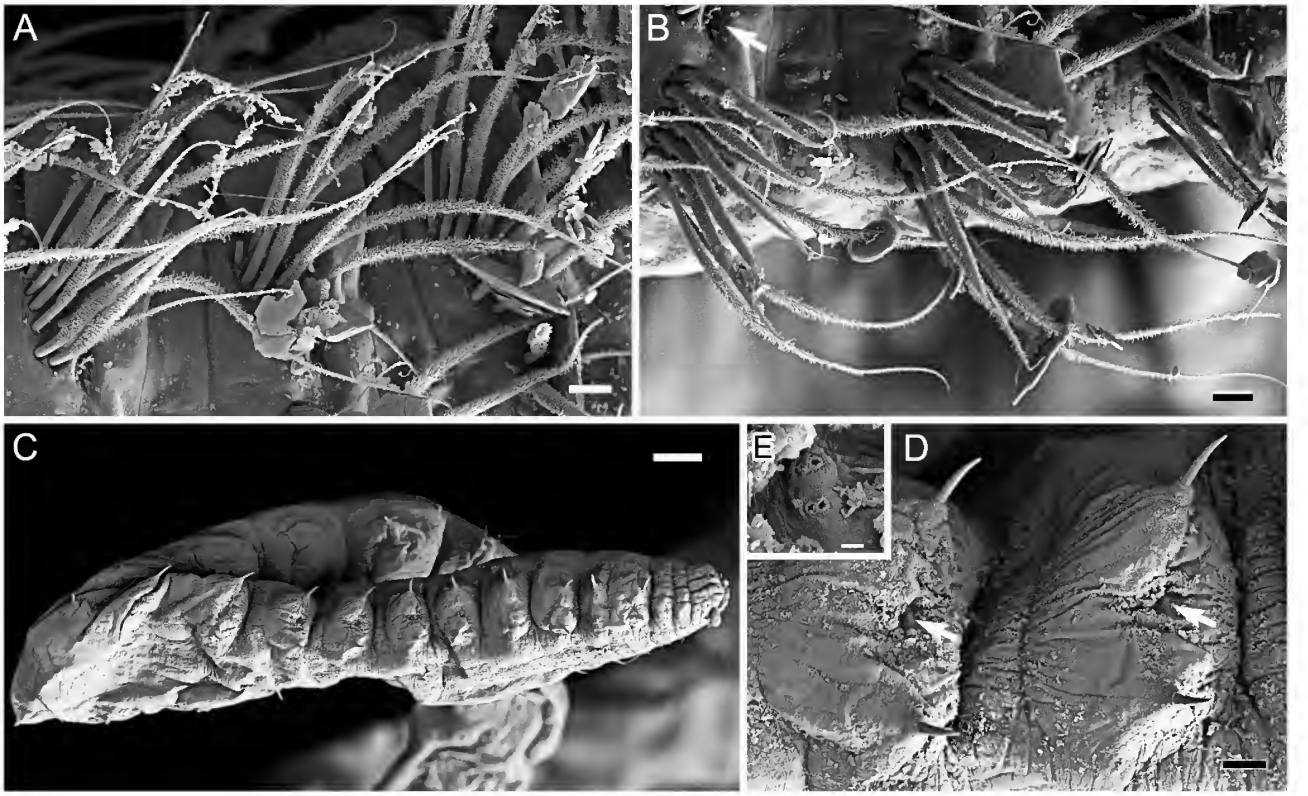


Figure 3. *Cossura aciculata* (Wu & Chen, 1977). SEM, W.42861. *(A)* notopodia of chaetigers 4–6; *(B)* neuropodia of chaetigers 4–6 (arrow indicates lateral organs); *(C)* posterior end, lateral view; *(D)* parapodia of posterior end (arrows indicate lateral organs); *(E)* lateral organ. Scale bars: *A, B, D* = 20 µm, *C* = 100 µm, *E* = 2 µm.

## *Cossura consimilis* Read, 2000

Fig. 4

*Cossura consimilis* Read, 2000: 1099, figs 1–3.

**Type locality**. New Zealand, Big Glory Bay, Stewart Island, 46°58'54"S 168°7'31"E.

**Material examined**. *New Zealand*. 10 specimens, 2 posterior fragments, South Island, Banks Peninsula, Scrubby Bay (43°37'22"S 172°56'58"E), May 2002, Stn 1.1, W.45625; 6 specimens, South Island, Banks Peninsula, Scrubby Bay (43°37'22"S 172°56'58"E), May 2002, Stn 1.2, W.45626; 4 specimens, South Island, Banks Peninsula, Scrubby Bay (43°37'22"S 172°56'58"E), May 2002, Stn 2.1, W.45627; 12 specimens, South Island, Banks Peninsula, Scrubby Bay (43°37'22"S 172°56'58"E), May 2002, Stn 5.1, W.45628.

**Description**. All specimens incomplete, 250–550 µm wide. 21–32 (usually 27–31) thoracic chaetigers but without sharp border between body regions. Anterior segments not swollen, without glandular pads or biannulations dorsally (Fig. 4D,G). Chaetal bundles arise from anterior borders of segments in thorax; shifted to middle part of segments in the abdomen; chaetae less numerous and thinner, segments longer in abdomen; in posterior region segments very short (Fig. 4A,E,H).

Prostomium blunt conical, with round tip, with more or less developed prostomial furrow, depending of muscle contraction (Fig. 4B,G). Branchial filament attached to segmental border between chaetigers 2 and 3; in some specimens it is closer to chaetiger 2 (Fig. 4D,G), in others closer to chaetiger 3 (Fig. 4F).

Chaetiger 1 with uniramous parapodia, all the next segments bearing biramous parapodia with closely arranged rami (Fig. 4D,F). All chaetate hirsute capillaries, arranged in two rows, especially clear in anterior chaetigers (Fig. 4F). Thicker and shorter chaetae located in anterior row, thinner ones in posterior; neurochaetae slightly thicker than notochaetae or same width (Fig. 4D,E,F). First chaetiger bearing 7–8 chaetae; in next thoracic segments 5–6 + 6–7 chaetae in notopodia and 4–5 + 5–6 in neuropodia in anterior and posterior rows, respectively; in posterior thoracic segments chaetae more numerous and thinner. In abdominal segments 4–5 long thin capillaries in notopodia and 5–6 in neuropodia. In posterior abdomen chaetae arising from lateral buds (Fig. 4H).

Pygidium with three long anal cirri, without intercirral processes (Fig. 4H).

**Remarks**. The main differences from the original description (Read, 2000) is the attachment of branchial filament between chaetigers 2 and 3 instead of the anterior border of chaetiger 3, a different interpretation of prostomium-peristomium border and less average number of thoracic chaetigers, but later can be due to size variability of this character. *Cossura consimilis* is very similar to *C. soyeri* from the Mediterranean and Gulf of Mexico: both species have a high number (21–31) of thoracic chaetigers, a very close position of branchial filament (between chaetigers 2 and 3 or on posterior border of chaetiger 2, respectively), pygidium with three anal cirri and without other papillae.

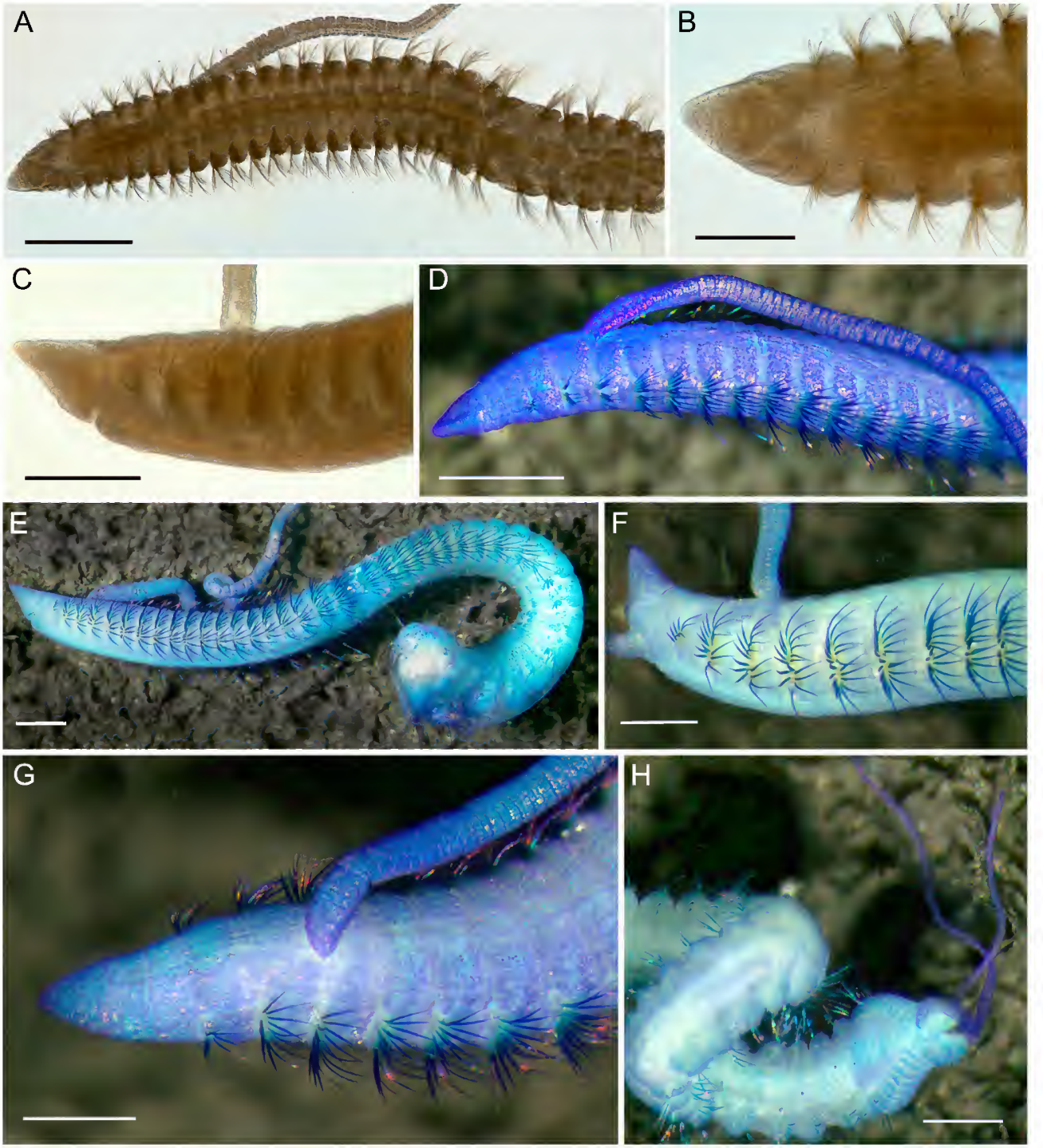


Figure 4. *Cossura consimilis* Read, 2000. Light microscopy. *A–C* (W.45625), compound microscope; *D–H,* stereomicroscope, stained with methylen blue. *(A)* thoracic region, dorsal view; *(B)* anterior part, dorsal view; *(C)* anterior part, lateral view; *(D)* W.45625, anterior part, dorso–lateral view; *(E)* W.45626, anterior fragment, lateral view; *(F)*W.45626, anterior end, lateral view; *(G)* W.45626, anterior part, dorsolateral view; *(H)* W.45625, posterior region, ventral view. Scale bars: *A, D, E* = 500 µm, *B, C, F, H* = 200 µm, *G* = 100 µm.


Figure 5. *Cossura* cf. *ginesi* Liñero-Arana & Díaz-Díaz, 2010. Light microscopy. *A, B, D,* compound microscope; C, E–*H,* stereomicroscope. *E–G* stained with methylen blue. *(A)* W.30833, dorsal view; *(B)* same specimen, anterior view; *(C)* W.202744, general dorsal view; *(D)* W.42864, abdominal parapodium; *(E)* W.42864, dorsal view; *(F)* W.202744, lateral view; *(G)* W.202744, lateral view of chaetigers 2–9; *(H)* W.202744, anterior end, dorsal view. Scale bars: *A, C, E* = 500 µm, *B, F* = 200 µm, *D* = 50 µm, *G, H* = 100 µm.

## *Cossura* sp. cf. *ginesi* Liñero-Arana & Díaz-Díaz, 2010

Figs 5, 6

*Cossura ginesi* Liñero-Arana & Díaz-Díaz, 2010: 791, figs 1, 2.

**Type locality**. North of the Paria Peninsula, Venezuela, 10°41'27"N 63°15'33"W.

**Material examined**. *Queensland*. 1 specimen, Ports Survey CRIMP Ports Integration Project Cairns, Wharf 12 (16°52'S 145°49'E), W.30833; 11 specimens, Shoalwater Bay, Triangular Islets (22°23'S 150°31'E), coll. Lewis & Forsyth, W.202744; 16 specimens, Calliope River, Gladstone (23°51'S 151°10'E), W.43728; 1 specimen, Halifax Bay, near mouth of Althaus creek (19°10'S 146°37'E), depth 2 m, 85-2-C2, Feb. 1985, coll. Queensland Nickel, W.43332; 10 specimens, Halifax Bay, near mouth of Althaus creek (19°10'S 146°37'E), depth 2 m, 85-2-C3, coll. Queensland Nickel, W.43341.—*New South Wales*. 1 specimen, Foster NSW 2280, south east end of Yahoo Island, Wallis Lake (32°15'05"S 152°30'05" E), grab, depth 3.4 m, mud + dead shells, 24.03.2003, RV *Baragula*, coll. P.B. Berents, S.J. Keable, R.T. Johnson, W.42864.

**Description**. All specimens studied incomplete, with 20–33 chaetigers, 4–6 mm in length; body width about 500 µm. 9–11 thoracic chaetigers but without clear border between body regions (Fig 5A,C). Borders between segments can be more or less distinct depending of relaxation and condition of worm. Chaetigers 1–2 dorsally without clear borders, often swollen (Figs 5F,H, 6B,C). Chaetigers 3–9 often biannulated, with chaetae-bearing annuli wider and laterally swollen (Figs 5E, 6A–C). In chaetigers 1–4 chaetae located in anterior part of segments, in chaetigers 4–9 in the middle, beginning from chaetiger 10 close to posterior border (Figs 5B,C,F,H, 6B,C,E,F). Segments becoming longer in the abdominal region. Branchial filament arising from posterior border of chaetiger 2 (Figs 5F, 6B,C). Anterior part of the body often swollen dorsally anteriorly from branchial filament (Figs 5F, 6B,C).

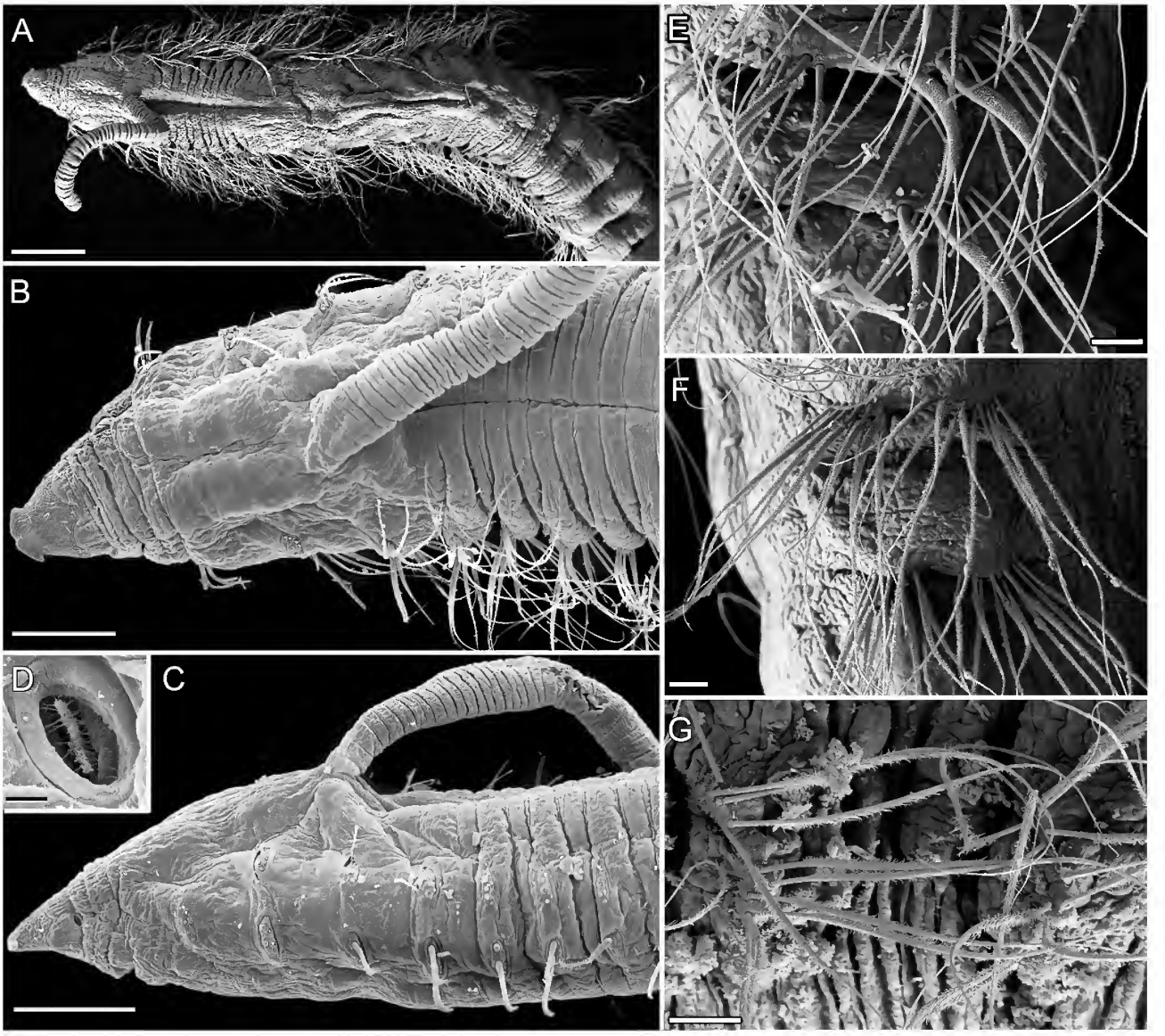


Figure 6. *Cossura* cf. *ginesi* Liñero-Arana & Díaz-Díaz, 2010. SEM. *(A)* W.42864, dorsal general view; *(B)* W.43332, anterior end, dorsal view; *(C)* W.43332, anterior end, lateral view; *(D)* W.43332, nuchal organ; *(E)* W.42864, parapodia of chaetiger 7; *(F)* W.42864, parapodia of chaetiger 13; *(G)* W.42864, parapodia of chaetiger 24. Scale bars: *A* = 400 µm, *B, C* = 200 µm, *D* = 5 µm, *E, F, G* = 40 µm.

Prostomium from conical to trapezium-shaped, with anterior extension, represented by small semicircular lobe (Fig. 5B) to two well-developed lobes with anterior notch between them, sometimes looking like lateral horns (Figs 5H, 6B,C). Nuchal organs represented by oval ciliated pits located on lateral side of the prostomium (Fig. 6C,D). Both prostomium and peristomium having secondary furrows subdividing them so the prostomial-peristomial border not clear (Figs 5H, 6B,C).

Chaetiger 1 with uniramous parapodia, all the next segments bearing biramous parapodia with widely arranged rami (Figs 5F,G, 6C). All chaetae are hirsute capillaries; arranged in two rows, especially clear in anterior chaetigers. Thicker chaetae are located in anterior row, thinner ones in posterior. First chaetiger bears two thicker chaetae in anterior row and 3–4 thinner ones in posterior; next 8–10 neuropodia bear two very thick brown curved chaetae (10.3–18.0 μm in thickness), widened in middle part, with distal end long thread-like in anterior row in more dorsal position, and four thinner capillaries in posterior row and more ventrally (Figs 5G, 6E). Notopodia with three thick (but thinner than in neuropodia) chaetae in anterior row and more ventrally, and four thin capillaries posteriorly and dorsally (Fig. 6E). Beginning from chaetiger 11–12 difference in thickness becoming less, all chaetae more or less similar capillaries, up to 10 per ramus (Fig. 6F,G).

Oocytes fulfilling body cavity observed in two specimens from Queensland, Shoalwater Bay, Triangular Islets (W.202744). Posterior end unknown.

**Remarks**. Specimens investigated here are very similar with *Cossura ginesi* Liñero-Arana & Díaz-Díaz, 2010 described from Venezuela waters and having anterior extensions of the prostomium. This character is unique among cossurids that usually have conical or rounded prostomium. In Australian worms these extensions is poorly developed and sometimes clear median notch is developed at the end of the prostomium; whereas in Venezuela worms prostomial extensions forms well-defined horns and there is no median notch. Other similarities are two very thick curved chaetae with long thin tips in anterior neuropodia and a comparatively small number of anterior (thoracic) segments (15–16 in *C. ginesi* and 9–11 in Australian specimens). It is not clear whether differences are due to intraspecific variability or Australian worm represent a new species.

## *Cossura hutchingsae* n. sp.

Figs 7, 8

**Type locality**. Australia, New South Wales, Hawkesbury River.

**Type material**. Holotype anterior fragment with 18 chaetigers, all thoracic, 3 mm long, 0.64 mm wide, New South Wales, Hawkesbury River, 200 m south of eastern end of Spectacle Island, 8-V-84 3-3-3 W.43372.

Paratypes, 9 specimens, Victoria, mouth of Yarra River, Hobsons Bay, Port Phillip Bay (37°50'29"S 144°53'52"E), 23 Jun. 1975, coll. Marine Studies Group, W.16338; 1 specimen, New South Wales, Hawkesbury River, 200 m south-east of Croppy Point (33°33'S 151°17'E), 21-VIII-84 2-3-3, W.42865.

**Additional material examined**. *New South Wales*. 1 specimen, Hawkesbury River, between Juno Head and Hungry Beach (33°34'S 151°16'E), mid-stream, 07 Aug. 1981, 1-3-2, depth 10 m, coll. A.R. Jones, A. Murray, W.43417; 1 specimen, Hawkesbury River, 200 m south of eastern end of Spectacle Island (33°32'30"S 151°13'30"E), 3-3-2, 05 Aug. 1984, depth 5 m, Smith-McIntyre grab, sandy mud, coll. A.R. Jones, A. Murray, W.43369; 1 specimen, 3242 Bega River, Tathra 2008, west of Hancock Bridge (36°41'54"S 149°58'15" E), depth 5.9 m, 3 April 2008, coll. K.B. Attwood, S.J. Keable, A. Murray, R.T. Springthorpe, RV *Baragula*, van Veen grab, sandy mud, W.43346; 1 specimen, west of La Perouse, Botany Bay (33°59'24"S 151°12'48"E), 10 Mar. 1977, depth 13 m, coll. State Pollution Control Commission, st.99, W.13652; 1 specimen, Botany Bay, west of La Perouse (33°59'18" S 151°12'38"E), depth 19.2 m, 02 Feb. 1977, col. State Pollution Control Commission, st.81, W.13653.—*Queensland*. 1 specimen, Calliope River, Gladstone (23°51'S 151°10'E), Dec. 1976, coll. P.Saenger, W.13224.

**Diagnosis**. Prostomium trapezium-shaped with wide round anterior margin. 17–21 thoracic chaetigers; border between body regions unclear. Branchial filament arising from border between chaetigers 2 and 3. Anterior margins of thoracic segmental borders dorsally drawn forward. Thoracic neuropodia with 2–3 very thick bent chaetae with long thread-like distal tips; other chaetae in thorax and abdomen capillary.

**Description**. All specimens incomplete, with 18–50 segments, 4–12 mm in length, 0.4–0.8 mm in width. Anterior region (thorax) with 17–21 chaetigers; border between regions unclear (Figs 7A, 8A,B). In specimen with gametes in body cavity they start from chaetiger 24. Thoracic chaetigers have glandular inflations on their lateral and dorsal sides, mid-dorsally dorsal groove located between them. Anterior margins of segmental borders dorsally drawn forward, to the base of branchial filament (Figs 7B,E, 8A). Segments becoming longer in the abdominal region.

Prostomium trapezium-shaped, flattened dorsoventrally, anterior margin from semi-circular to almost straight (Figs 7B,E, 8C). Posterior ring as long as peristomium; border with peristomium not always clear; prostomial furrow developed to various degrees; in some specimens additional furrows in prostomium and peristomium.

Branchial filament arising from border between chaetigers 2 and 3 (Figs 7B,D–F, 8C,D), in some cases may be impression of its attachment from anterior border of chaetiger 3. Nuchal organs not seen.

Chaetiger 1 with uniramous parapodia, all next segments bearing biramous parapodia. All chaetae hirsute capillaries with smooth shafts; arranged in two indistinct rows. Thicker chaetae are located in anterior row, thinner ones in posterior (Fig. 7D,F,G). First chaetiger bears four or five chaetae, in next segments notopodia bear 5 chaetae in anterior row and 4–5 in posterior, neuropodia bear 2–3 very thick (14–16.5 μm in thickness) bent chaetae with long thread-like distal tips in anterior row and 4–5 capillaries in posterior (Figs 7F,G, 8E,F). After chaetiger 10–13 these thick chaetae replaced with normal capillary chaetae. Chaetae in abdomen thinner and more numerous, 12–14 chaetae per ramus (Fig. 8G).

Gametes in body cavity were observed in one specimen from Victoria (W.16338) (Fig. 7A).

Posterior end unknown.

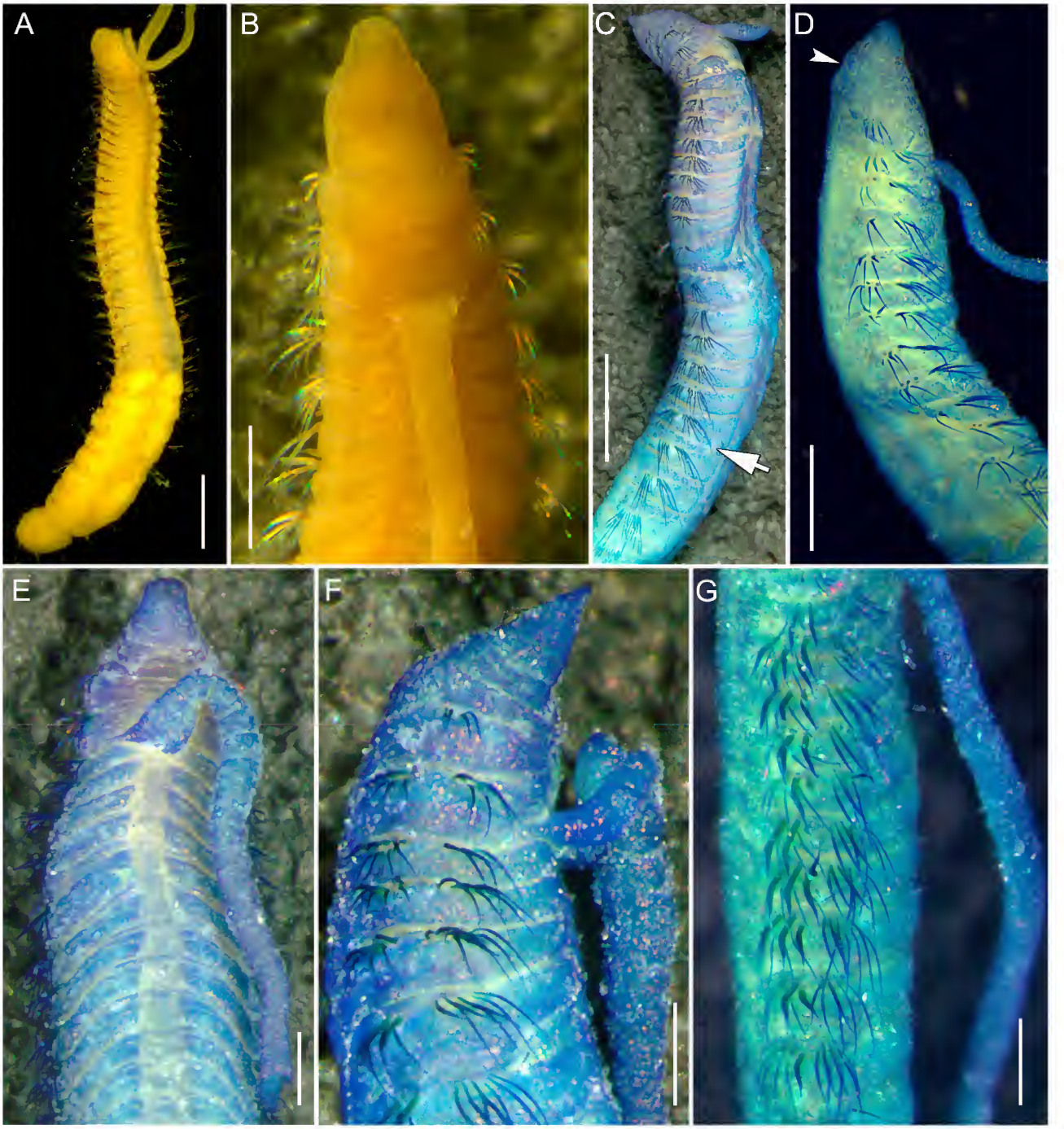


Figure 7. *Cossura hutchingsae* n. sp. Stereo microscope, *C–G* stained with methylen blue. *(A)* paratype, W.16338, dorsolateral view, gametes in the middle region are seen; *(B)* W.43346, anterior end, dorsal view; *(C)* paratype, W.42865, dorsolateral view (arrow indicates border between regions; chaetae bundles shifted to the middle of segments); *(D)* W.13652, anterior end, lateral view; arrowhead indicates mouth opening; *(E)* holotype, W.43372, anterior end, dorsal view; *(F)* holotype, W.43372, anterior end, lateral view; *(G)* W.43369, chaetigers 3–13, lateral view. Scale bars: *A, D* = 600 µm, *B, E, F, G* = 200 µm, *C* = 1 mm.

**Etymology**. This species has been named in honour of Pat Hutchings from Australian Museum, in recognition of her great contribution to the knowledge of polychaetes and Australian marine biota.

**Remarks**. Thickened chaetae in thoracic chaetigers are described also for *Cossura heterochaeta*, *C. rostrata* Fauchald, 1972, and *C. ginesi*. *Cossura ginesi* differs by the shape of prostomium with anterior extension. *Cossura heterochaeta* and *C. rostrata* have a conical prostomium (round to obtuse in *C. hutchingsae* n.sp.), and there are two types of anterior thickened chaetae—with arista and without it—in *C. heterochaeta*, whereas in our worms they are uniform having aristas. Besides, *C. hutchingsae* n.sp. has more anterior segments (17–21 instead of 12–14 in *C. heterochaeta*). The most characteristic features of this new species are the inflated pads in thorax and the segmental borders drawn forward dorsally, giving it a peculiar appearance.

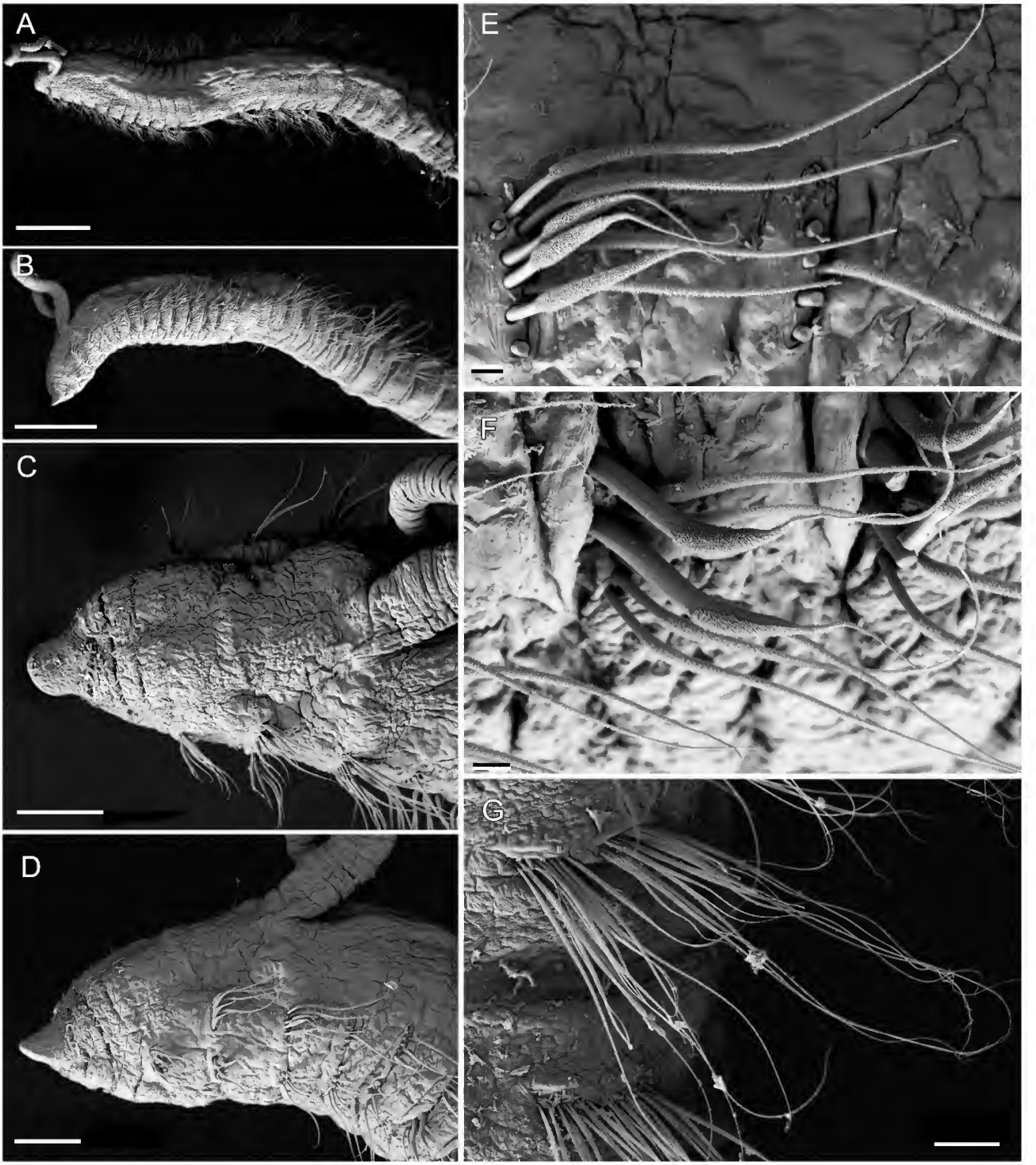


Figure 8. *Cossura hutchingsae* n. sp. Paratype, W.42865, SEM. *(A)* general view from dorsal side; *(B)* general view from lateral side; *(C)* anterior end, dorsal view; *(D)* anterior end, lateral view; *(E)* notochaetae of chaetiger 3; *(F)* neurochetae of chaetiger 6; *(G)* parapodia of chaetiger 25. Scale bars: *A, B* = 1 mm, *C, D* = 200 µm, *E, F* = 20 µm, *G* = 100 µm.

### *Cossura keablei* n. sp.

Figs 9–11

**Type locality**. Fiji, Suva Harbour.

**Type material**. Holotype anterior fragment 0.5 mm wide, 8.75 mm long, with 24 thoracic chaetigers; Fiji, Suva Harbour (18°8'S 178°25'E), Oct. 1998, coll. Shirley Mohammed, stn.18 A, W.45623.

Paratypes 2 specimens, Philippines, west coast of Marinduque Island (13°30'N 121°30'E), Dec. 1996, coll. MARCOPPER staff, Stn. 30, W.27171; 1 complete specimen, SEM pin mount, Philippines, west coast of Marinduque Island (13°30'N 121°30'E), Dec. 1996, coll. MARCOPPER staff, Stn. 30, W.42862; 1 specimen, Fiji, Suva Harbour (18°8'S 178°25'E), Benthic survey, Oct. 1998, coll. Shirley Mohammed, stn.18 A, W.46099.

**Additional material examined**. *Philippines*. 3 specimens, West coast of Marinduque island (13°30'N 121°30'E), W.27175.—*Fiji*. 3 specimens, stn.19B, Suva & Nadi Harbour, Benthic survey, Oct. 1998, coll. Shirley Mohammed, W.43358; 1 specimen, Suva & Nadi Harbour, Benthic survey, Oct. 1998, coll. Shirley Mohammed, stn.7B, W.43355; 1 specimen, Suva & Nadi Harbour, Benthic survey, Oct. 1998, coll. Shirley Mohammed, stn. 31 A, W.43354; 9 specimens, Suva & Nadi Harbour, Benthic survey, Oct. 1998, coll. Shirley Mohammed, stn.34B, W.43357.

**Diagnosis**. Prostomium rectangular or trapezium-shaped, with round or almost straight anterior margin, flattened dorsoventrally. 22–26 thoracic chaetigers; anterior segments without glandular pads. Branchial filament arising from chaetiger 3. All chaetae capillary of similar thickness. Thoracic chaetigers with 6–9 chaetae per ramus, abdominal chaetigers with 2–3 thin capillary chaetae in each ramus. Pygidium without cirri and other appendages.

**Description**. Body length of complete specimen (W.42862) about 4.5 mm, width 300 µm, consisting of 46 chaetigers. 22–26 thoracic chaetigers. Border between regions unclear, abdomen differs by position of parapodia on the middle of segment, less number of chaetae in bundles and longer segments (Figs 9A, 10A, 11F). Anterior segments without glandular pads (Fig. 9C).

Prostomium rectangular or trapezium-shaped, with round or almost straight anterior margin, flattened dorsoventrally (Figs 9C,D, 10C,D, 11A,B). Prostomial furrow well defined, posterior ring wider than prostomium, shorter or same length with peristomium, with midventral notch (Figs 9C,D, 10C, 11B). Branchial filament arising from anteromedial part of chaetiger 3 (Figs 9C, 10C, 11B).

Chaetiger 1 with uniramous parapodia, all next segments with biramous parapodia with widely arranged rami. All chaetae hirsute capillaries; arranged in two rows. First chaetiger bearing 8–10 chaetae, next segments 6–9 chaetae in each ramus, neurochaetae in anterior rows slightly thicker than other chaetae (Figs 10A,B,D, 11B–E). Lateral organs seen behind chaetae fascicles beneath notopodia (Fig. 11B). In abdominal region segments having two, rarely three thin, non-hirsute chaetae in each ramus (Figs 10E, 11F).

Pygidium without cirri and other appendages (probably lost) (Fig. 10F).

**Etymology**. This species has been named in honour of Steven Keable, in recognition of his great effort to maintain and improve the collection of invertebrates of Australian museum.

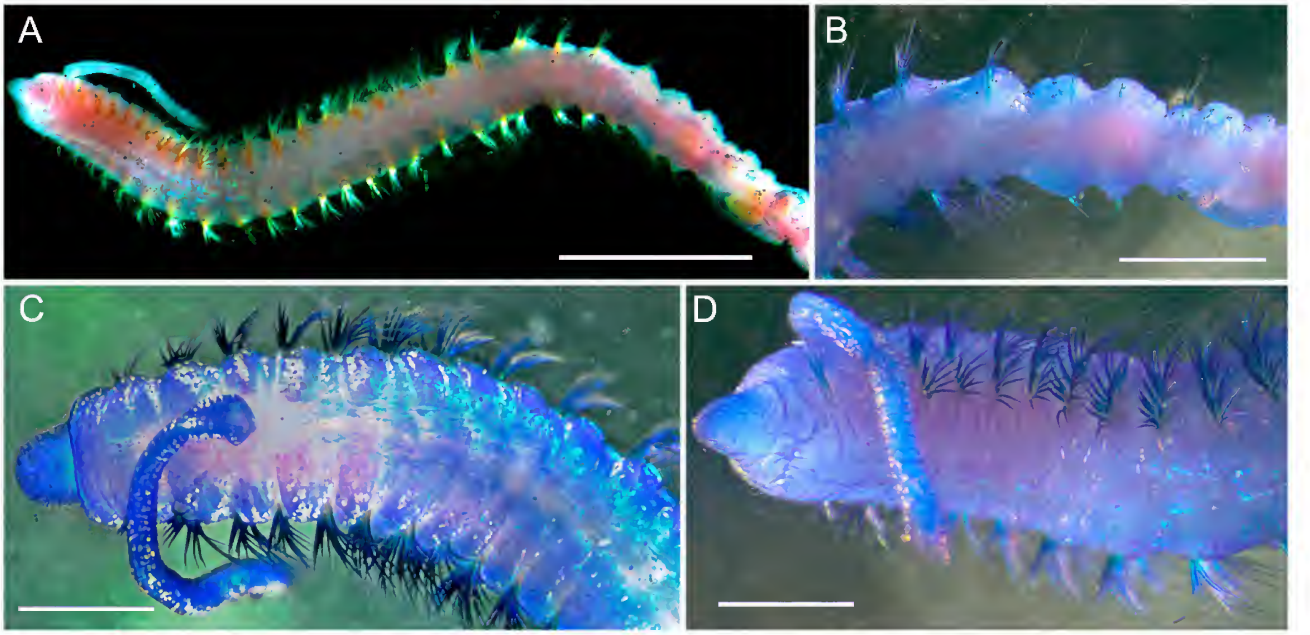


Figure 9. *Cossura keablei* n. sp. W.45623, holotype, stereomicroscope. B–D stained with methylen blue. *(A)* general ventral view; *(B)* transitional region; *(C)* anterior end, dorsal view; *(D)* anterior end, ventrolateral view. Scale bars: *A* = 1 mm, *B–D* = 300 µm.


Figure 10. *Cossura keablei* n. sp. Compound microscope. *(A)* W.27171, paratype, general view, anterior end from lateral, then from dorsal; *(B)* W.46099, paratype, lateral view; *(C)* W.27175, anterior end, dorsal view; *(D)* W.27171, paratype, anterior end, lateral view; *(E)* W.27171, paratype, abdominal parapodia; *(F)* W.27171, paratype, posterior end, dorsolateral view. Scale bars: *A, B* = 500 µm, *C, D* = 200 µm, *E, F* = 100 µm.

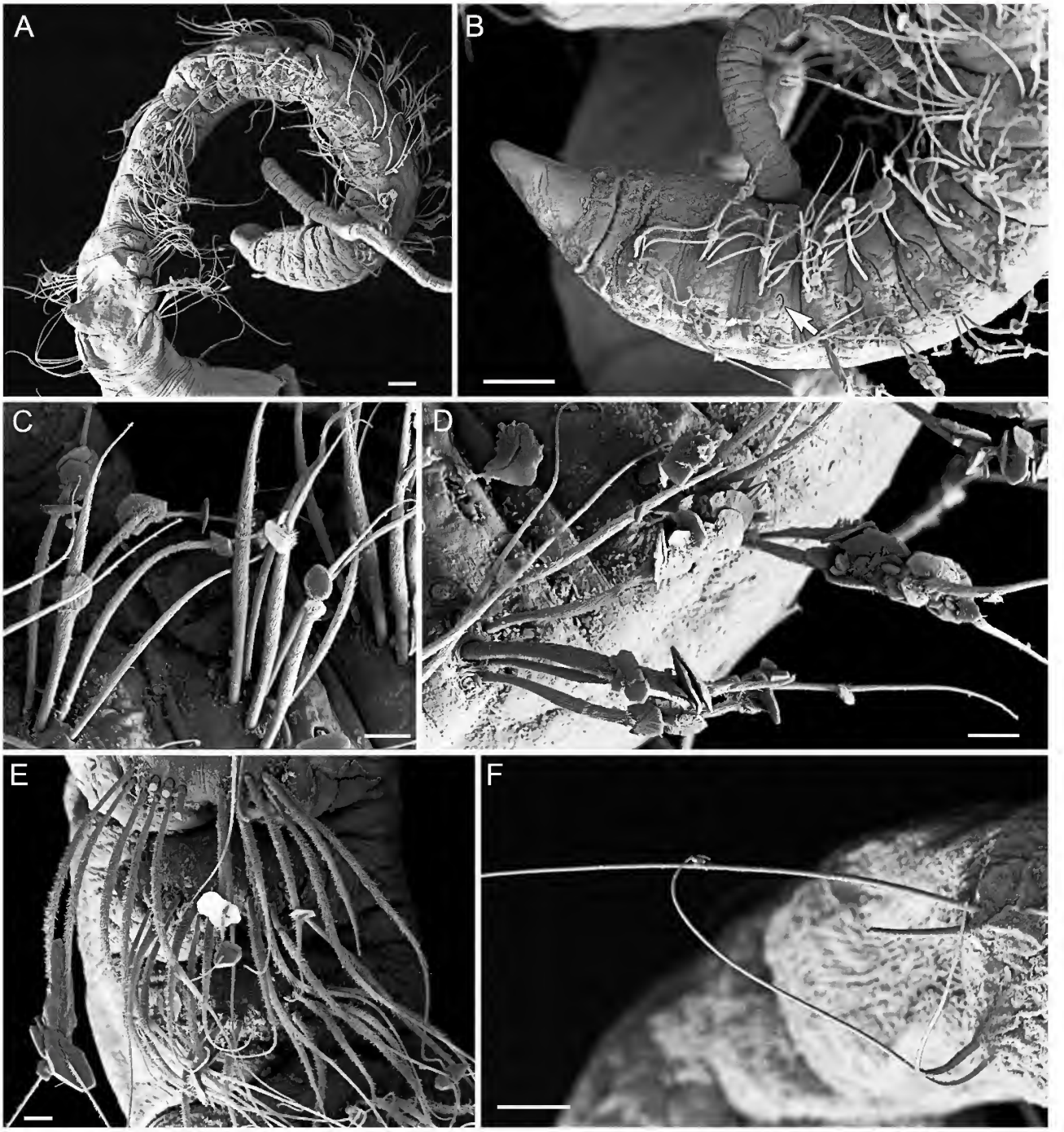


Figure 11. *Cossura keablei* n. sp. Paratype, W.42862, SEM. *(A)* general view; thorax and beginning of abdomen; anterior end: posterolateral view, abdomen: ventral view; *(B)* anterior end, lateral view (arrow indicates lateral organ); *(C)* notopodia of chaetiger 3; *(D)* neuropodia of chaetiger 4; *(E)* parapodia of chaetigers 18–20; *(F)* abdominal parapodia. Scale bars: *A, B* = 100 μm, *C–F* = 20 μm.

**Remarks**. Few cossurid species also have the branchial filament on chaetiger 3 and no acicular chaetae in abdomen: *Cossura candida* Hartman, 1955, *C. bansei* Hilbig, *C. chilensis* Hartmann-Schröder, 1965, *C. bansei* Hilbig, 1996, *C. dayi* Hartman, 1976, *C. delta* Reish 1958 and *C. consimilis* Read, 2000. *Cossura keablei* differs from them by the trapezium shape of prostomium and by having 2–3 capillary chaetae per ramus in the abdominal region. Moreover, *C. chilensis* has 19 thoracic chaetigers, *C.delta* has 15–18 thoracic chaetigers which is less, and *C.consimilis* has 27–31 thoracic chaetigers which is more than in *C. keablei*. *Cossura brunnea* Fauchald, 1972 has trapezium prostomium but differs by less number of thoracic chaetigers, dark pigment pattern over the median and posterior regions of its body, and having three long anal cirri.

## *Cossura* sp. cf. *longocirrata* Webster & Benedict, 1887

Figs 12, 13

*Cossura longocirrata* Webster & Benedict, 1887: 743, pl. 8, figs 105–107.—Fournier & Petersen, 1991: 65, figs 1–2.

**Type locality**. Eastport, Maine.

**Material examined**. *New South Wales*. 1 complete specimen, Pittwale (33°35'49"S 151°18'51"E), Ceridan Fraser's Honour project, depth 15.8 m, sandy mud, coll. P.A. Hutchings, K.B. Attwood, C. Fraser, RV *Baragula*, NSW 2740, 02 Dec. 2004, W.42959; 2 specimens, Pittwale (33°35'49"S 151°18'51"E), Ceridan Fraser's Honour project, depth 15.8 m, sandy mud, coll. P.A. Hutchings, K.B. Attwood, C. Fraser, RV *Baragula*, NSW 2740, 02 Dec. 2004, W.42960; 1 specimen, Pittwater (33°36'02"S 151°18'46"E), 25 Aug. 1994, depth 16.1 m, mud, FAC2 05Pit2/2B Australian Museum Party, W.23619; 1 specimen, Hawkesbury River, near Hungry Beach (33°35'S 151°17'E), 27-V-83 1-1-1, depth 4 m, coll. A.R. Jones, A. Murray, Smith-McIntyre grab, sandy mud, W.43367; 1 specimen, Botany Bay, 200–500 m west of runway extension (33°57'49"S 151°10'26"E), F.A.C. Study, G6-2-4, NSW-772, April 1992, depth 7 m, W.43325; 3 specimens, Hawkesbury River, near Hungry Beach (33°35'S 151°17'E), 04 Feb. 1983, Hawkesbury River Survey, depth 4 m, Smith-McIntyre grab, sandy mud, coll. A.R. Jones, A. Murray, W.43253; 1 specimen, Hawkesbury River, between Juno Head and Hungry Beach, mid-stream (33°34'S 151°16'E), Hawkesbury River Survey, depth 10 m, 06 Nov. 1981, Smith-McIntyre grab, muddy sand, coll. A.R. Jones, A. Murray, W.43254; 24 specimens, Hawkesbury, Brooklyn Boat Channel (33°33'S 151°14'E), River Brooklin dredging, H.R.S. Polychaetes, 21 Aug. 1980, coll. A.R. Jones *et al.*, W.196734.

**Description**. Complete specimen (W.42959) has 46 chaetigers, body length 5.6 mm, body width 200 µm. Another incomplete specimen is 300 µm in width, 2.3 mm in length having 27 chaetigers. 13–18 (in rare case 22–23) thoracic chaetigers without clear border between regions (Figs 12A,B, 13A). In thoracic region chaetae emerge from the anterior margin of segments, body flattened dorsoventrally, segments short. Methylen blue staining revealed dark, probably glandular cells on lateral and dorsal parts of segments, but segments are not inflated (Figs 12H, 13A). In abdominal region segments longer, body cylindrical, chaetae thinner and less numerous (Figs 12A,B, 13A).

Prostomium conical, not flattened, with pointed tip, without eyes, nuchal organs not seen (Figs 12I, 13B,C,F). Prostomial furrow well defined in contracted specimens, in well-relaxed specimens absent. Posterior prostomial ring shorter than peristomium. Lateral margins of both prostomial parts usually convex, less straight (Figs 12B,F, 13I). Branchial filament arising from posterior part of chaetiger 2; in contracted specimens looking as attached to border between chaetigers 2 and 3 (Figs 12G,H, 13B,C).

Chaetiger 1 with uniramous parapodia, all the next segments bear biramous ones. All chaetae hirsute capillaries; arranged in two rows. Thicker chaetae located in anterior row, thinner ones in posterior. First chaetiger bearing 4–7 chaetae, next up to 9 in notopodia and up to 10 in neuropodia. 3 thick anterior neuropodial chaetae thicker than 3 thick anterior notopopodial chaetae (Figs 12E, 13H,I). In posterior thoracic and abdominal chaetigers all chaetae becoming thinner, less numerous and less hirsute, 4–5 chaetae per ramus (Figs 12G, 13J).

Oocytes observed in body cavity in specimens from Pittwale (W.42960) and Hawkesbury River (W.43367).

Pygidium with three long anal cirri, without intercirral processes (Figs 12F, 13D). Cirri easily lost, in most specimens only one or two cirri present. In one specimen (W.42960) pygidium was regenerating (Fig. 13B,C).

**Remarks**. This species closely resembled *C. longocirrata* Webster & Benedict, 1887, having a conical prostomium, branchial filament inserted to chaetiger 2, no intercirral anal processes, absence of heavy acicular thoracic chaetae. Australian worms differ by generally less number of thoracic chaetigers (13–18, rarely up to 22, instead of 16–21 in *C. longocirrata*). But it is not clear if they really belong to a separate species or represent an example of intraspecific variability. Detailed redescription of numerous specimens from different localities including type material of *C. longocirrata* was done by Fournier & Petersen (1991). They concluded it is a cold-temperate arctic-boreal species; it has usually been collected from below the halocline at a salinity of 30 or higher and a year-round bottom temperature below 5°C; it is doubtful whether C. *longocirrata* occurs anywhere in the Pacific Ocean. The most probably Australian worms described here represent a separate species but we did not find morphological characters allowing to erect a new species. An analysis using molecular methods is required to solve this problem. Furthermore, in our material was also present a similar species *C.* sp. cf. *pygodactylata*, that differs mostly by the presence of intercirral anal processes, but most specimens are incomplete, so there is a possibility that there is a mixture of two species in material referred to *Cossura* sp. cf. *longocirrata*.

## *Cossura* sp. cf. *pygodactylata* Jones, 1956

Fig. 14

*Cossura pygodactylata* Jones, 1956: 127, fig. 1a–f.

**Type locality**. San Francisco Bay, California.

**Material examined**. *New South Wales*. 2 specimens (1 complete), Botany Bay, 200–500 m west of runway extension (33°57'49"S 151°10'26"E), 06 Apr. 1992, depth 7 m, Smith-McIntyre grab, col. Australian Museum party, W.21514; 2 specimens (1 complete), Clyde River Estuary (35°42'25"S 150°08'20" E), 01 Dec. 2010, depth 2 m, col. K. Dafforn, W.43215.

**Description**. Body length of complete specimen from W.21514 about 4.1 mm, width about 330 µm, 40 chaetigers. 13–17 thoracic chaetigers, without sharp border between regions (Fig. 14A). Segments not swollen, without glandular pads dorsally (Fig. 14F). Chaetal bundles arising from anterior borders of segments in thorax; shifted to the middle part of the segments on the abdomen; chaetae become less numerous and thinner, segments become longer in the abdomen (Fig. 14A).

Prostomium conical; prostomial furrow weakly developed; posterior ring when present as long as peristomium (Fig. 14B,C,E,F). Branchial filament arising from middle-posterior part of chaetiger 2 (Fig. 14F,G).

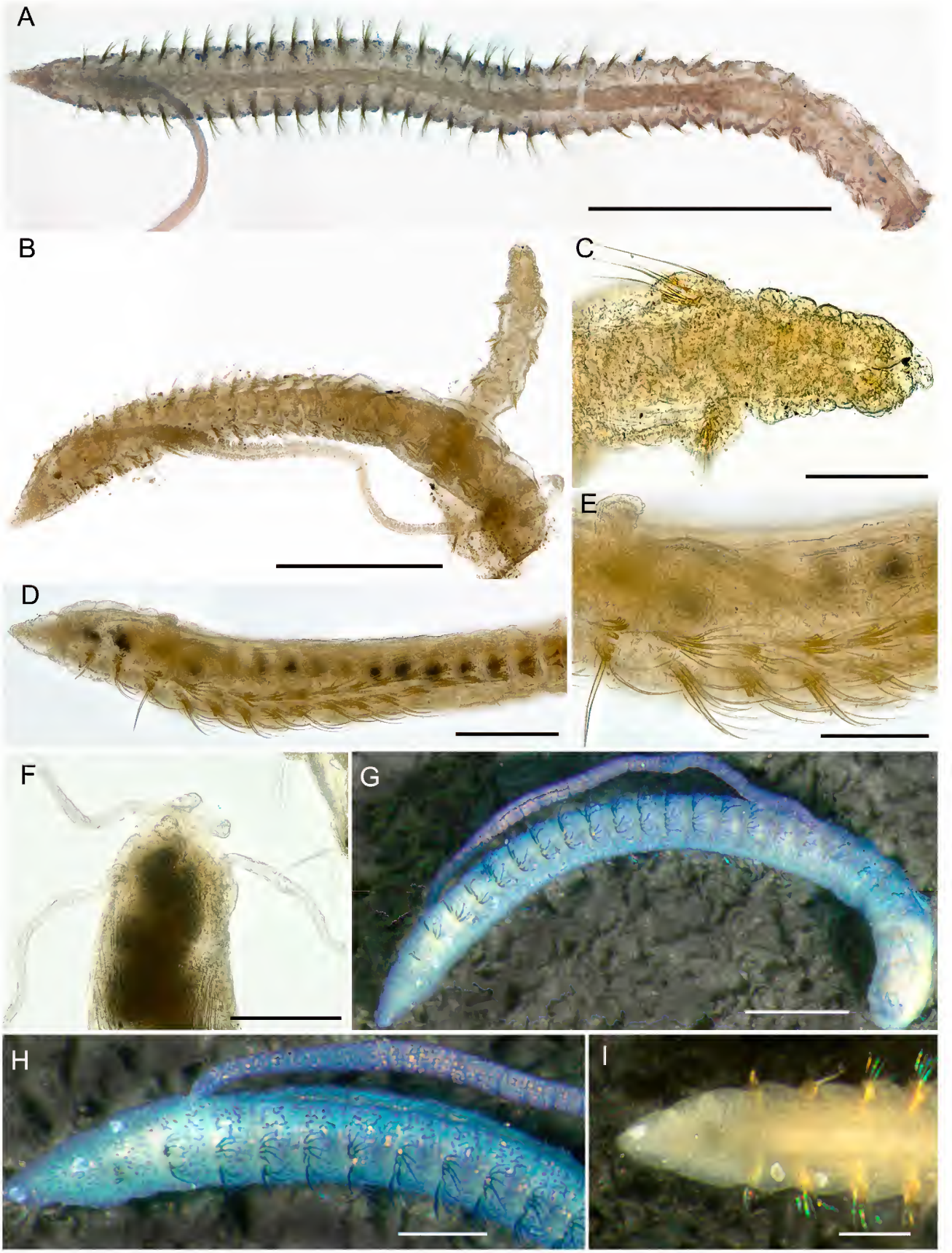


Figure 12. *Cossura* cf. *longocirrata* Webster & Benedict, 1887. Light microscopy. *A–F,* compound microscope, *G–I,* stereomicroscope; *G, H,* methylen blue staining. *(A)* W.43325, general dorsal view; *(B)* W.42960, complete specimen with regenerating pygidium; anterior part dorsally, posterior ventrally; *(C)* same specimen, pygidium; *(D)* W.23619, lateral view; *(E)* same specimen, parapodia of chaetigers 3–7; *(F)* same specimen as in *(D),* pygidium; *(G)* W.43367, general lateral view; *(H)* same specimen as in *(G)*, anterior end laterally; *(I)* same specimen, anterior end dorsally. Scale bars: *A, B* = 500 µm, *C, E, F* = 100 µm, *D, H, I* = 200 µm, *G* = 300 µm.

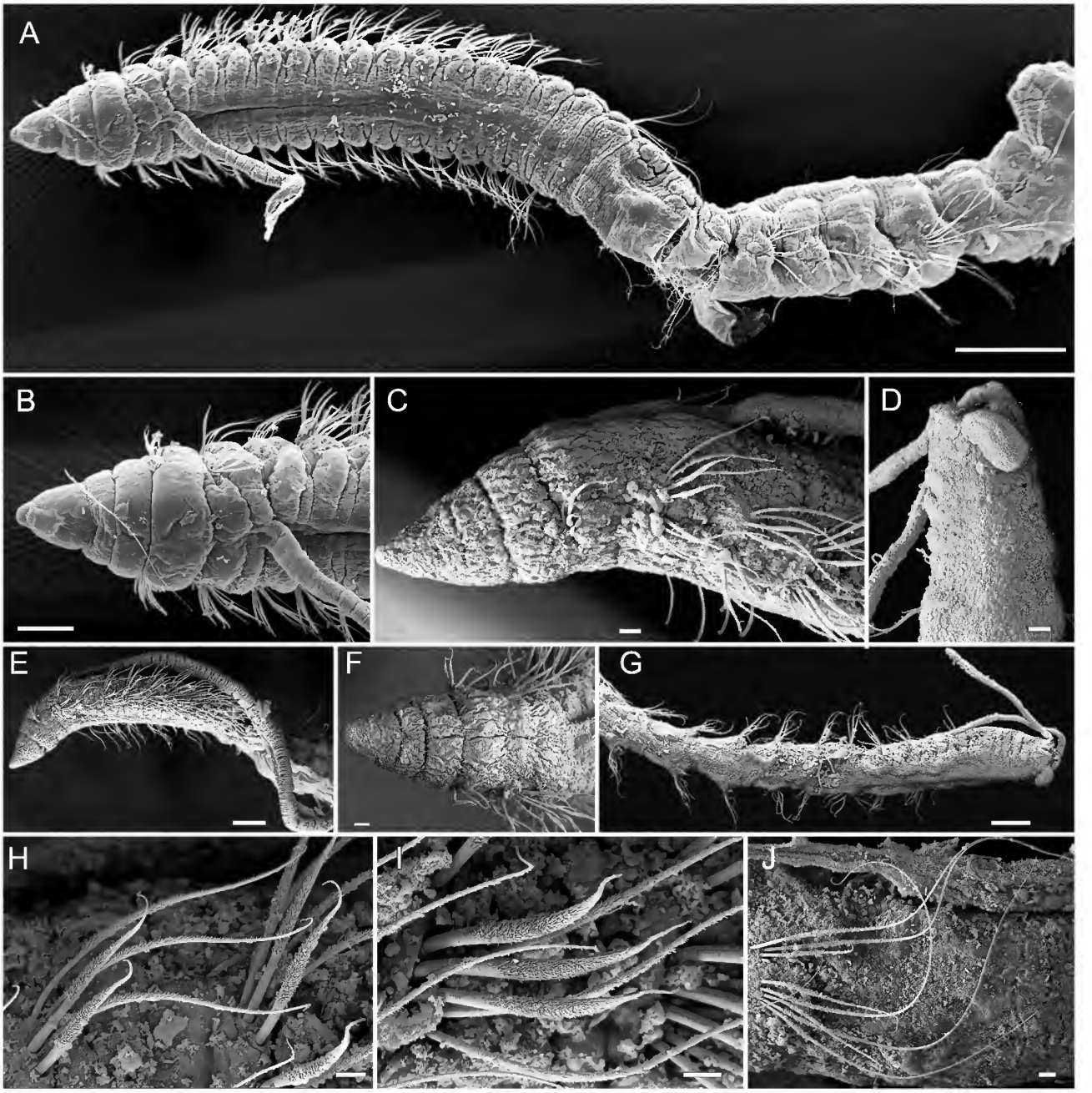


Figure 13. *Cossura* cf. *longocirrata* Webster & Benedict, 1887. SEM. *A, B* (W.196734), *C–J* (W.42959). *(A)* dorsal general view; *(B)* anterior end, dorsal view; *(C)* anterior end, lateral view; *(D)* pygidium, ventral view; *(E)* anterior region, lateral view; *(F)* anterior end, dorsal view; *(G)* posterior region, dorsolateral view; *(H)* notopodia of chaetigers 5–6; *(I)* neuropodia of chaetigers 5–6; *(J)* parapodia of chaetiger 22. Scale bars: *A* = 300 µm, *B, E, G* = 100 µm, *C, D, F* = 20 µm, *H–J* = 10 µm.

Chaetiger 1 with uniramous parapodia, all next segments bearing biramous parapodia. All chaetae hirsute capillaries, in anterior chaetigers arranged in two indistinct rows. Thicker and shorter chaetae in anterior part of thorax; thinner and longer ones in posterior thorax and abdomen. Notochaetae as thick as neurochaetae (Fig. 14B,G).

Pygidium with three long cirri and 8–12 shorter intercirral processes (Fig. 14D,H).

Complete specimen (W.21514) bears oocytes in body cavity.

**Remarks**. *Cossura pygodactylata* Jones, 1956 is the single cossurid species known to bear intercirral anal processes (another such species, *C. lepida* Tamai, 1986 from Japan, was synonymized with *C. pygodactylata* by Hilbig [1996]). This species has a wide geographical distribution and is rather variable by size and number of thoracic segments. Probably different geographical populations belong to different but morphologically similar species. This question requires further investigations using molecular methods. Australian worms correspond with descriptions of *C. pygodactylata* from California, Japan, Atlantic (France) and White Sea (Russia). *Cossura* sp. cf. *pygodactylata* is also very similar with *C.* sp. cf. *longocirrata* when posterior end is missing by branchial filament arising from chaetiger 2, conical shape of prostomium and number of thoracic chaetigers; differences are *C.* sp. cf. *longocirrata* has neurochaetae notably thicker than neurochaetae in anterior thorax whereas in *C.* sp. cf. *pygodactylata* this difference is less pronounced.

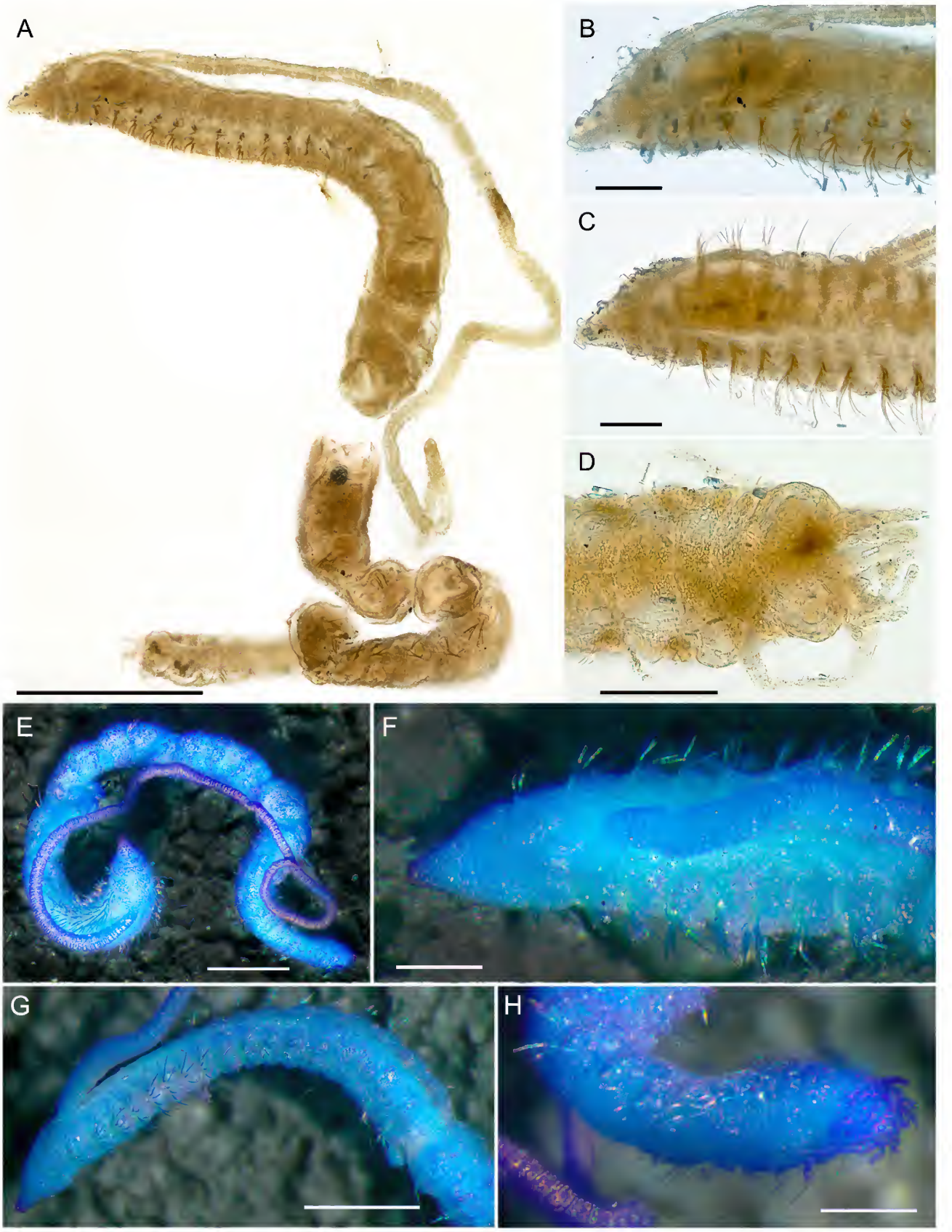


Figure 14. *Cossura* cf. *pygodactylata* Jones, 1956. Light microscopy, *A–D* (W.21514) compound microscope, *E–H* (W.43215) stereomicroscope. *(A)* general lateral view; *(B)* anterior end, lateral view; *(C)* anterior end, dorsal view; *(D)* pygidium, ventral view; *(E)* general view; *(F)* anterior end, dorsal view; *(G)* anterior end, lateral view; *(H)* posterior end with pygidium, ventrolateral view. Scale bars: *A* = 500 µm; *B–D, F, H* = 100 µm; *E, G* = 300 µm.

### *Cossura queenslandensis* n.sp.

Figs 15, 16

**Type locality**. Queensland, Calliope River, Gladstone.

**Type material**. Holotype fragment 10.5 mm long, 0.36 mm wide, 35 chaetigers, slides of 36th and 37th chaetigers, Queensland, Calliope River, Gladstone (23°51'S 151°10'E), depth 8.3 m, sandy mud, Oct. 1977, coll. P. Saenger, Trans.5, Stn.2, W.16477. Paratypes 19 specimens, Queensland, Calliope River, Gladstone (23°51'S 151°10'E), depth 1.3 m, sandy mud, Oct. 1977, coll. P. Saenger, Trans.10, Stn.2, W.16432; paratype SEM pin mount, Queensland, Calliope River, Gladstone (23°51'S 151°10'E), depth 1.3 m, sandy mud, Oct. 1977, coll. P. Saenger, Trans.10, Stn.2, W.42863.

**Additional material examined**. *Queensland*. 100+ specimens including complete, Calliope River, Gladstone (23°51'S 151°10'E), 1974, coll. P. Saenger, W.199308; 4 specimens, SEM stub mounts, Calliope River, Gladstone (23°51'S 151°10'E), 1974, coll. P. Saenger, W.43260; 2 specimens, mouth of Althaus Creek, Halifax Bay, north of Townsville (19°10'S 146°36'E), depth 2 m, 1977, coll. Queensland Nickel, W.202193; 5 specimens, Halifax Bay, 85-2-B4, W.43338; 7 specimens, Auckland Creek, Gladstone (23°51'S 151°14'E), Aug. 1976, coll. P. Saenger, Trans.3, Stn.3, W.13222.

**Description**. Complete specimens are 29–90 mm long, 250–300 µm wide, with 43–66 chaetigers. 17–20 thoracic chaetigers, no sharp border between body regions. Body thickest in anterior abdomen, tapering to both ends (Fig. 15A,E,F). Segments not swollen, without glandular pads or biannulations dorsally (Figs 15G, 16J). Chaetal bundles arising from anterior border of segments in thorax; shifted to the middle part of segments in the abdomen; in abdomen chaetae less numerous and thinner, segments longer (Fig. 15A). No bead-like segments in posterior abdomen (Fig. 15E,F).

Prostomium blunt conical, with round tip and broadened base (Figs 15B,G, 16B,L). Prostomial furrow developed in some specimens, posterior prostomial ring shorter or as long as peristomium. Lateral margins of prostomium straight or concave (Fig. 16L). Branchial filament attached to segmental border between chaetigers 2 and 3; in well relaxed specimens it looks closer to chaetiger 2, in others closer to chaetiger 3 (Fig. 15G, H, I, 16C, I, J). One specimen with 6 everted buccal tentacles, in others tentacles inverted.

Chaetiger 1 with uniramous parapodia, all the next segments with biramous parapodia with closely arranged rami. All chaetate hirsute capillaries, arranged in two rows, especially clear in anterior chaetigers (Fig. 15H, I, 16C, F, G, I, J). Thicker and shorter chaetae located in anterior row, thinner ones in posterior. First chaetiger bearing 4–7 chaetae; in next thoracic segments 4–5 + 3–4 chaetae in notopodia and 4–5 + 3–4 in neuropodia in anterior and posterior rows, respectively. Difference in thickness of chaetae little, notochaetae and neurochaetae of same width (Fig. 15H, I, J, K). In abdominal segments 3–4 long thin capillaries in notopodia and 4–5 in neuropodia (Fig. 16M).

Pygidium with three middle-long anal cirri, without intercirral processes (Fig. 15C, J–L, 16E, N). Anal cirri easily lost, most specimens bearing one or two cirri, in some cases they are short, most probably regenerating.

**Etymology**. Named after type locality.

**Remarks**. *Cossura queenslandensis* n.sp is very similar to *C.* cf. *longocirrata*. Main differences are: 1, *C. queenslandensis* has a bigger and longer body; 2, the tip of the prostomium is more round in *C. queenslandensis*; 3, *C. queenslandensis* has more thoracic chaetigers, 17–20 instead of 13–15 in *C.* cf. *longocirrata* (but this character is variable in both species); 4, thoracic neurochaetae and notochaetae have almost the same width (in *C.* cf. *longocirrata* neurochaetae are thicker); 5, *C. queenslandensis* was found in Queensland, *C.* cf. *longocirrata* in NSW.

*Cossura consimilis* Read, 2000 is similar with *C. queenslandensis* n.sp. by the attachment of branchial filament, the round tip of conical prostomium, the shape of anterior chaetae, but this species is bigger and longer (average width 460 µm and up to 660 µm, up to 17 mm long) and has more thoracic chaetigers (21–32 instead of 17–20 in *C. queenslandensis*).

### *Cossura* sp. A

Fig. 17

**Material examined**. Anterior fragment, 1.1 mm wide, 7 mm long; New South Wales, east of Gigue (36°59'24"S 150°21'12"E), RV *Franklin*, FR1086-06, 11 Dec. 1986, depth 900 m, thick grey mud and abundant worm tubes, W.23618.

**Description**. Specimen incomplete, with 28 chaetigers, all thoracic. Big and thick worm with cylindrical body. Coloration uniform yellow. Chaetal bundles arising from anterior borders of segments; in chaetigers 27–28 slightly shifted towards middle parts (Fig. 17A). Segments bearing inflations, probably glandular, divided by dorsal groove; segmental borders perpendicular to body axis (Fig. 17A, C).

Prostomium short, round, flattened dorsoventrally, triangle from lateral view, with developed prostomial furrow (Fig. 17C,D). Posterior ring slightly shorter than peristomium. Beginning from posterior prostomial ring body rapidly expanding in width and in thickness. Branchial filament arising from anterior border of third chaetiger (Fig. 17C,D).

Chaetiger 1 with uniramous parapodia, all the next segments with biramous parapodia. All chaetae are capillaries arranged in two distinct rows (Fig. 17B,D). Neuropodia bearing 5 thicker chaetae in anterior row and 9–10 thinner ones in posterior row. Notopodia bear 6–7 chaetae in each row, all notochaetae as thick as posterior neuropodial chaetae (Fig. 17B). Posterior end unknown.

**Remarks**. Without the abdominal part it is impossible to identify this specimen. It is unknown if *Cossura* sp. A has acicular chaetae on abdomen. It differs from most *Cossura* species with branchial filament arising from chaetiger 3 by its bigger size and its number of thoracic chaetigers (at least 28). Description of *C. sima* Fauchald, 1972 corresponds by the body width and number of thoracic chaetigers as well as by round shape of the anterior border of the prostomium, but in *Cossura* sp. A prostomium is longer and body rapidly expands in width beginning from the posterior prostomial ring, whereas in *C. sima* body width enlarges gradually; besides *C. sima* has dark pigment spots at the base of each parapodium and *Cossura* sp. A has uniform yellow body.

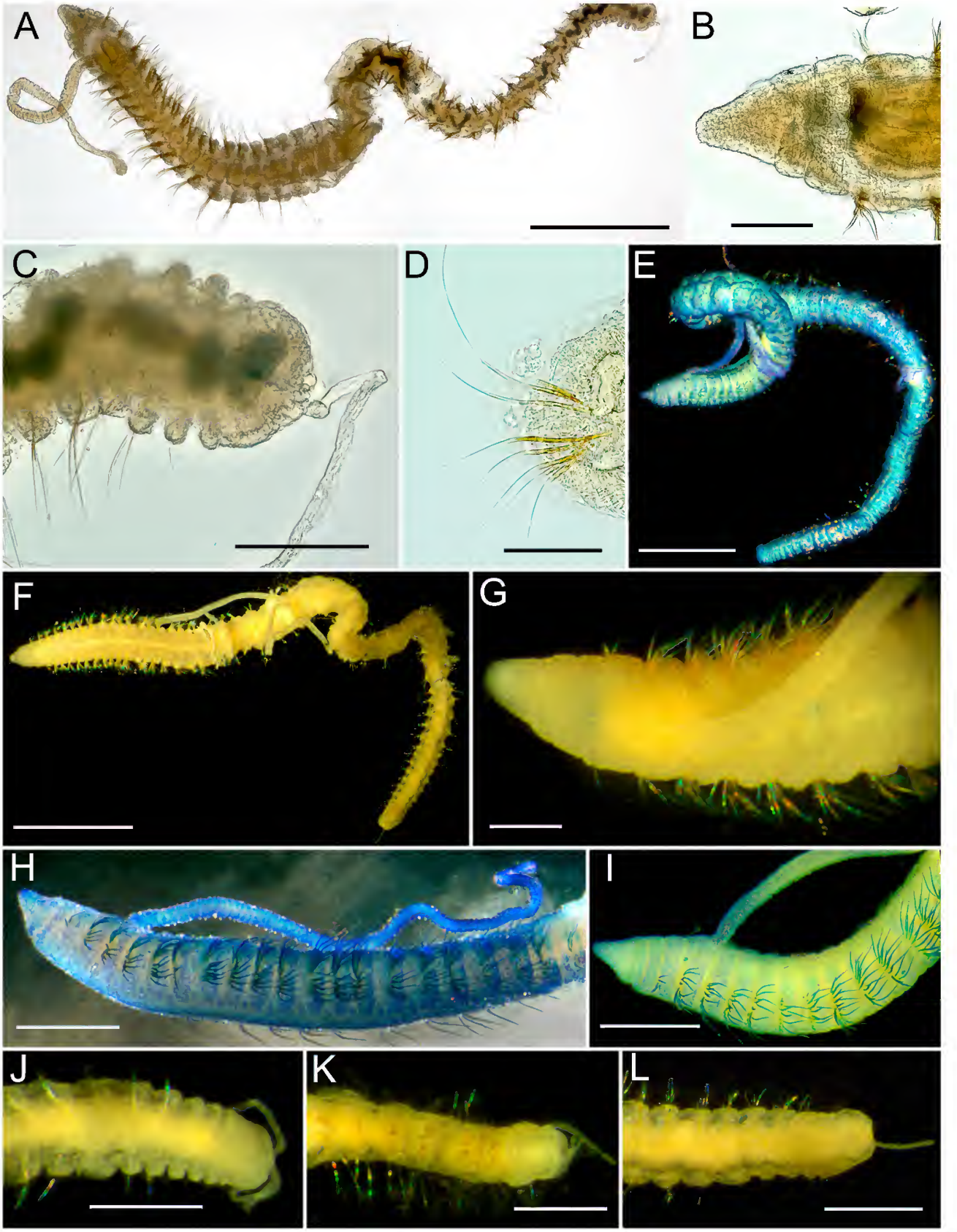


Figure 15. *Cossura queenslandensis* n. sp. Light microscopy. *A–D,* compound microscope; *E–L*, stereomicroscope; *D, H–I,* stained with methylen blue. *(A)* W.199308, general dorsal view; *(B)* W.199308, same specimen, anterior end, dorsal view; *(C)* W.199308, same specimen, pygidium; *(D)* W.16477, parapodium of chaetiger 37; *(E)* W.199308, general view, anterior part from lateral, middle from ventral, posterior from dorsal; *(F)* W.199308, another specimen, general ventral view; *(G)* W.16432, anterior end, dorsal view; *(H)* W.13222; anterior region, lateral view; *(I)* W.16477, anterior end, lateral view; *(J–L)* W.199308, pygidium. Scale bars: *A, E, F* = 500 μm, *B–D, G* = 100 μm, *H, I* = 300 μm, *J–L* = 200 μm.

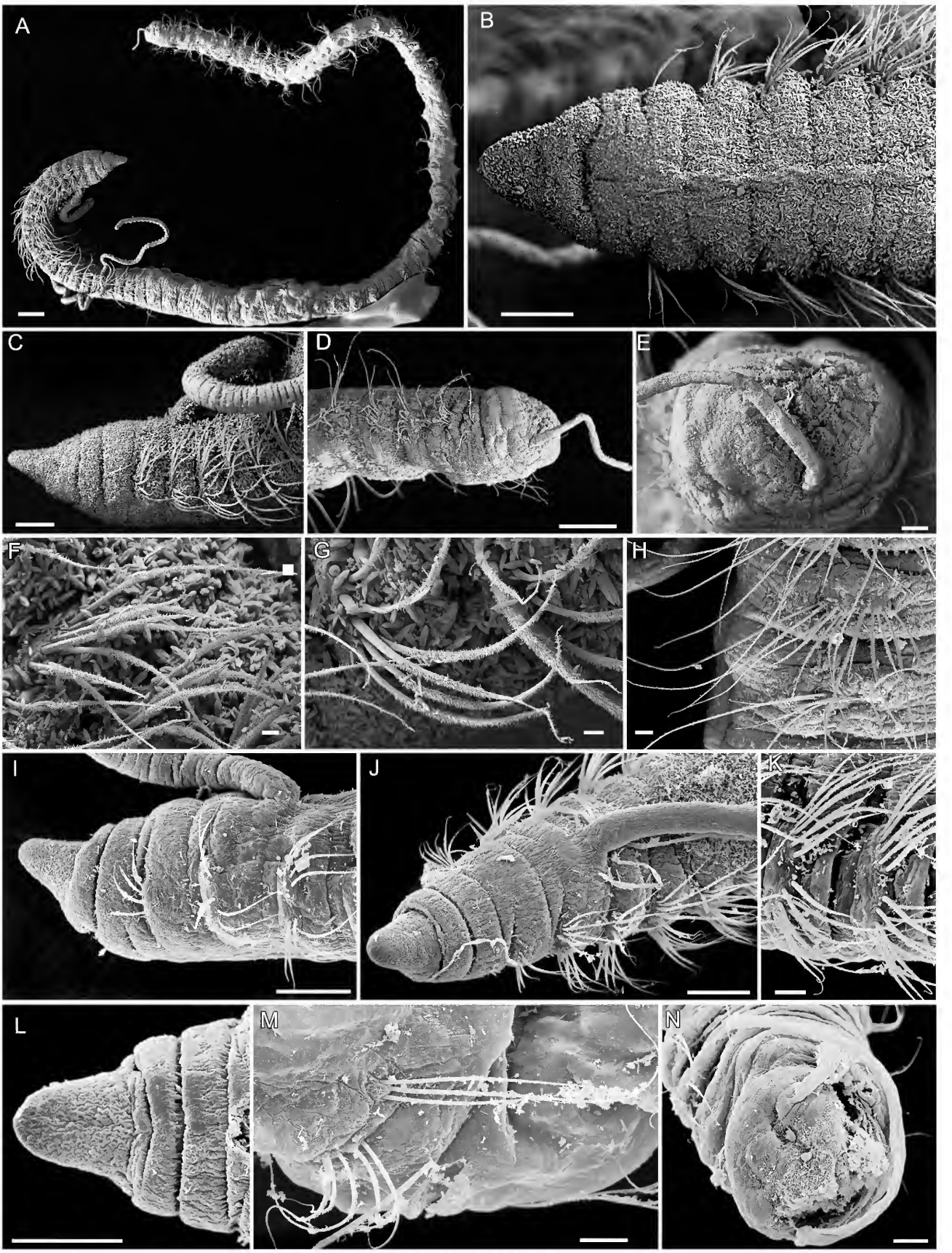


Figure 16. *Cossura queenslandensis* n. sp. SEM. *A–H* (W.42863), *I–N* (W.43260). *(A)* general view, anterior part laterally; *(B)* anterior end of the body, ventral view; *(C)* anterior end of the body, lateral view; *(D)* posterior end of the body, lateral view; *(E)* pygidium, posterior view; *(F)* notopodia of chaetigers 4–5; *(G)* neuropodia of chaetigers 4–5; *(H)* parapodia of chaetigers 19–21; *(I)* anterior end of the body, lateral view; *(J)* anterior end of the body, anterodorsal view; *(K)* parapodia of chaetiger 7; *(L)* head, dorsal view; *(M)* parapodia of chaetiger 26; *(N)* pygidium, posterior view. Scale bars: *A* = 200 µm, *B–D, I, J, L* = 100 µm, *E, H* = 20 µm, *F, G* = 10 µm, *K, M, N* = 30 µm.

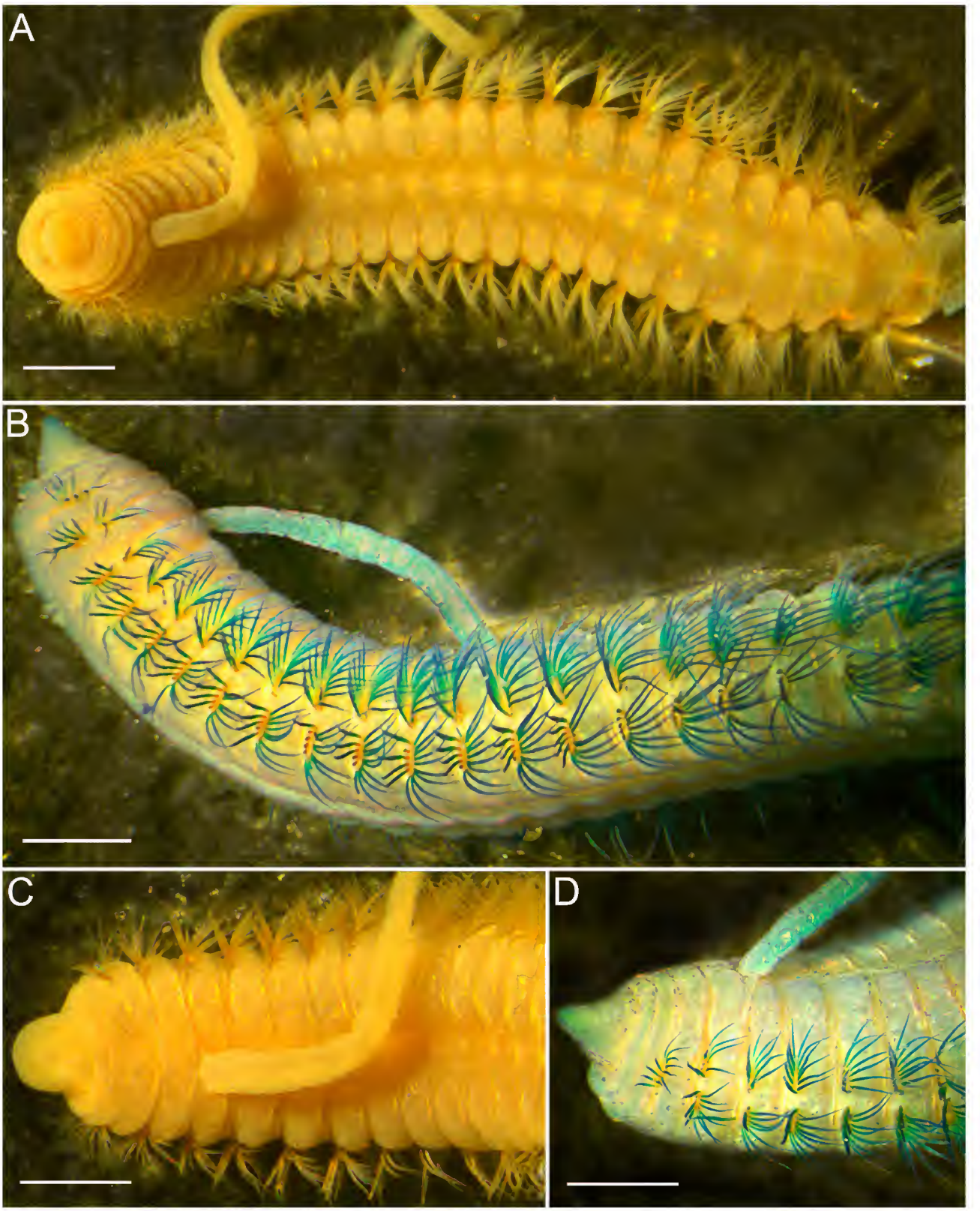


Figure 17. *Cossura* sp. A. W.23618, stereomicroscope; *B, D*, methylen blue staining. *(A)* dorsal general view; *(B)* lateral general view; *(C)* anterior end, dorsal view; *(D)* anterior end, lateral view. Scale bars: *A–D* = 500 µm.

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